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THE RIGHT BALANCE: A SEARCH FOR THE BEST FIT BETWEEN BUSINESS AND ETHICAL FACTORS IN SOFTWARE THAT AIDS STRATEGIC DECISION MAKING

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THE RIGHT BALANCE: A SEARCH FOR THE BEST FIT BETWEEN BUSINESS AND ETHICAL FACTORS IN SOFTWARE THAT AIDS STRATEGIC DECISION MAKING

A Dissertation

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By

AHMAD M. KABIL

Dr. Andrew Ciganek, Dissertation Chair

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ABSTRACT

With the expansion of using decision support systems (DSS) in making strategic business decisions and the wide spectrum of stakeholders affected by such usage, the need for considering ethical issues in these systems arises. Despite the growing use of DSS, numerous scandals due to unethical decisions have been reported. Several scholars have recommended considering ethical attributes along with the business attributes that are usually employed in the design of DSS. However, the balanced fit between DSS and both business and ethical requirement attributes has not been investigated. The current research is of an exploratory nature to investigate the impact of achieving such a balanced fit on system performance. The scope of the study focused on enterprise resource planning (ERP)-based DSS.

A research model leveraging the theory of task-technology fit (TTF) was proposed to examine the impact that attaining a balanced fit between ERP-based DSS and both business and ethical requirement attributes has on perceived system performance. A large-scale study was conducted using a random sample of information technology (IT) practitioners in private commercial companies in the United States. The United States has one of the highest rates of ERP adoption in the world and should offer insights relevant to practitioners in organizations worldwide. Existing scales were adapted and used for most constructs that comprise the research model, while a Q-sorting procedure was conducted to develop and validate new constructs. The survey was pilot tested and revised before participants were solicited for the large-scale study.

The data analysis was conducted in three phases: descriptive statistics and scale reliability, multiple regression modeling, and partial least squares structural equation modeling (PLS-SEM). The results showed that most ERP-based DSS implementations place a greater emphasis on business requirement attributes over ethical requirement attributes, which results in lower levels of a system's balanced fit. Organizations that equally emphasize and have a balanced fit between business and ethical attributes have a significant impact on the perceived system performance. Achieving a balanced fit accounts for more variance in perceived system performance than focusing on business or ethical attributes alone. The company's ethical environment has a positive effect on achieving a balanced fit between business and ethical attributes.

This dissertation contributes to the DSS literature in three ways. First, it demonstrates empirically the need for achieving a balanced fit of DSS to both business and ethical requirement attributes. Second, it extends TTF to task-technology balanced fit. Third, it adds a new concept of ethics-governance-by-design to the DSS research area.

Keywords: DSS, ERP-based DSS, theory of task-technology fit, TTF, task-technology balanced fit, TTBF, ethics-governance-by-design

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As businesses become larger and more complex, they become more reliant on decision support systems (DSS; Chae, Paradice, Courtney, & Cagle, 2005). Despite the growing use of DSS in making business decisions (Power, Sharda, & Burstein, 2015), several scandals due to unethical decisions have been reported. Companies such as Enron (2001), Swissair (2001), WorldCom (2002), Merck & Co. (2002), Global Crossing and Qwest (2002), AOL Time Warner (2002), Tyco International (2002), Ahold (2003), Parmalat (2003), YLine (2003), Computer Associates (2004), Adecco (2004), ABB (2004), Siemens (2006), Volkswagen (2015), and Facebook and Cambridge Analytica (2018) are examples of major companies with well-known ethical scandals (Bachmann, Ehrlich, & Ruzic, 2017; Bounie, Dubus, & Waelbroeck, 2018; Carson, 2003; Common, 2018; Hummel, Pfaff, & Rost, 2018; Robison, 2018; Smith, 2016; Trevino & Nelson, 2016; Tuttle, 2018).

For a long time, ethical failures have hurt many investors, creditors, suppliers, customers, employees, and even ordinary citizens. Numerous stakeholders have noticed that business decisions are not always being made with the expected level of integrity (Mathieson, 2007). As reported in the literature, several companies have assigned a chief officer of ethics and implement compliance programs (Weber & Wasieleski, 2013). Business leaders are well aware that an unethical decision, whatever the business value of it, can harm their companies and may make them personally liable under legislation such as the Sarbanes–Oxley Act of 2002 (Cole, 2019). In their recent article, Parboteeah, Weiss, and Hoegl (2018) stated that “business ethics continue to play a key role for most companies. As more scrutiny is paid to organizations and their executives' behaviors, understanding ethics in companies remains critical” (p. 12840).

In the example of Facebook and Cambridge Analytica (Tuttle, 2018), Facebook developed in 2010 a third-party application called Open Graph, which was expected to upsurge its sales volume. Using this application, external developers could access all personal data of Facebook users and their friends on the site. Cambridge Analytica, a political consulting firm that participated in the U.S. presidential election of 2016, gathered raw data from 87 million Facebook accounts without permission to build a system that could target U.S. voters with personalized political messages based on their psychological profile (Tuttle, 2018). Parakilas (2017), who worked on the privacy side at Facebook, reported in the New York Times, "The people whose job is to protect the user always are fighting an uphill battle against the people whose job is to make money for the company" (p. 1). Common (2018) stated, "We need specialist watchdogs who possess the expertise to identify risks to the public" (p. 2). The comments by Parakilas (2017) and Common (2018) illustrate the internal conflict between business and ethical requirements for effective decision making in many organizations.

In another example, Volkswagen built a low-cost clean diesel light car to compete with all other brands (Topham, Clarke, Levett, Scruton, & Fidler, 2015). In order to achieve this business goal, the company incorporated defeat devices in 11 million cars to make the cars appear to be polluting less than they were (Bachmann et al., 2017). The device could detect that the car was in test mode, and it would turn on emission controls for nitrogen oxide (NOx). Air pressure, steering wheel position, speed, and engine sensors were used to determine if the car was running on the testbed or the road (Figure 1).

When the defeat device detected that the car was on the road, the emission control was turned off, and the car emitted NOx 40 times above the permitted limit, which might cause asthma attacks and cardiovascular illnesses (Smith, 2016). The U.S. Environmental Protection

Agency (EPA) discovered the defeat device and brought the case to court. The case is considered one of the major industrial scandals in recent history (Bachmann et al., 2017). The scandal cost Volkswagen $17 billion USD, dropped share value by more than a third, and reduced sales of other German cars (e.g., BMW, Mercedes, Smart, etc.). The Volkswagen scandal is a typical case of DSS where full weight was given to business attributes and minimum weight to ethical attributes in decision making. The most curious aspect of the case is that Volkswagen had long ago adopted an enterprise resource planning (ERP)-based DSS from SAP, the most important producer of such systems (Stedman, 2000). The Volkswagen case is an example of an unbalanced fit of ERP-based DSS between business and ethical requirements.

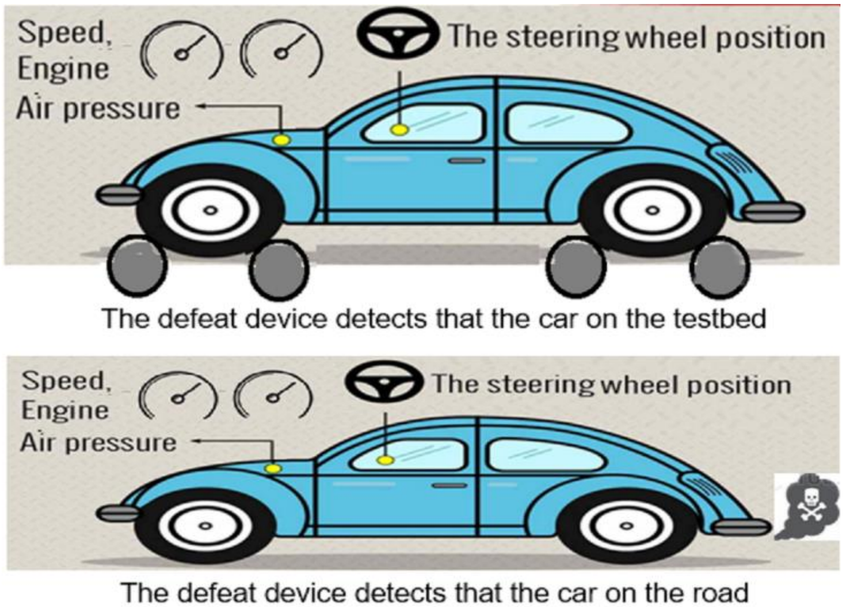

Figure 1. Sensors of defeat device on testbed and on the road (Sharma, 2015, p. 2).

Problem Definition

Umbach and Humphrey (2018) noticed that "corporate failures are, of course, nothing new, but the poor ethical practice evident in many of these cases has led to widespread reflection amongst practitioners and business analysts on the causes of ethical failures in business management" (p. 69). In the field of leadership management, scholars have focused on leadership authenticity (Wulffers, 2016), and in the field of corporate governance, scholars have focused on governance control (Engwall et al., 2017). In the field of DSS, which is the main focus of the current research, several scholars have recommended incorporating ethical attributes along with business attributes in the design of DSSs (Mathieson, 2007).

Some companies do not pay enough attention to ethical attributes in their DSS (Chae et al., 2005). The DSS is the main tool that managers can use for avoiding negative consequences (Asemi, Safari, & Zavareh, 2011). The DSS provides support for decision makers in semi-structured and unstructured situations by incorporating human judgment along with data and computerized models (Kitsios & Kamariotou, 2016). Incorporating ethical attributes within DSSs represents a real challenge for businesses today.

Chae et al. (2005) argued that DSSs are more than technical artifacts for achieving business tasks without accounting for their ethical implications; they proposed a model of ethical decision support systems (EDSS) which integrates Jones's (1991) model of moral intensity (MI) with Mitroff's (1997) five strategies for avoiding Type III errors of ignoring ethical issues in the problem definition of a DSS. Mathieson (2007) suggested developing a design science of ethical decision support to ensure that an EDSS can provide decision makers with guidance and restrictions for making decisions that reflect standard ethics and values. Mathieson (2007) argued that the first step in a design science of an EDSS is to develop a theoretical base that includes cognitive, social, and moral psychology along with business principles of the system.

Although most scholars have recommended giving more attention to moral issues and increasing the role of ethical attributes in DSS to be EDSS, researchers have not examined the relative importance between ethical attributes and business attributes in an EDSS. No guidance exists for how much weight should be given to ethical attributes relative to the weight given to business attributes in the system. A gap exists in the literature about how to achieve a balanced fit between the DSS and both business and ethical requirement attributes and its impact on system performance. Addressing this gap in the literature may reduce instances of ethical failures in business management (Umbach & Humphrey, 2018). This study investigated the impact of achieving a balanced fit between the DSS and both business and ethical requirements on the perceived system performance.

Scope of Research

The scope of research for the current study was focused on ERP-based DSS, which is a strategic decision-making platform at the enterprise level. Myers, Starliper, Summers, and Wood (2017) showed that the use of ERP-based DSS has a significant impact on perceived information credibility and managerial decision making. Such incentives pushed ERP implementation in most Fortune 500 companies (De-Ugarte, Artiba, Jbaida, & Pellerin, 2006; Morris & Venkatesh, 2010). There are several ERP vendors used by these companies, including SAP, Oracle, Microsoft, Infor, Epicor, and Sage (Fok, Kwong, Fok, & Zhang, 2017).

The widespread use of ERP-based DSS has not prevented ethical scandals like the case of Volkswagen (Bachmann et al., 2017), which happened in 2015 despite the company having adopted an SAP-ERP system in 2000 (Stedman, 2000). This dilemma and the scale of ethical failure scandals were the main motives of the current study.

Conceptual Framework for the Study

The main research question in this dissertation is: What is the impact of achieving a balanced fit between the ERP-based DSS and both business and ethical requirement attributes on perceived system performance? The theory of task-technology fit (TTF) was applied to examine the main research question (Figure 2).

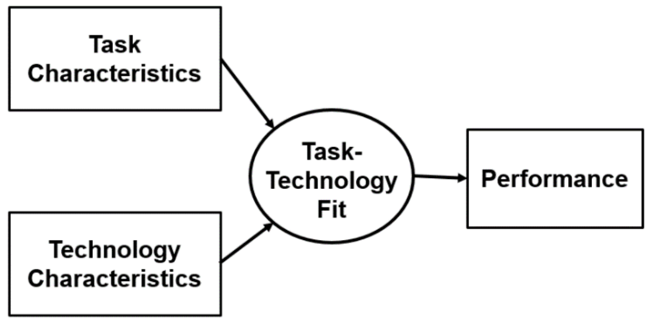

Figure 2. Theory of task-technology fit. Adapted from Goodhue and Thompson, 1995, p. 215.

The first reason of unsuccessful ERP software implementations as stated by Crnkovic (2013) is “the lack of software fit or the unbridgeable problems between software functionality and business needs” (p. 8). Goodhue and Thompson (1995) argued that “performance impacts will result from [TTF]—that is, when a technology provides features and support that ‘fit’ the requirements of a task” (p. 214). The TTF model extends the technology acceptance model (Venkatesh & Davis, 2000) by focusing on the user’s tasks that affect the use of technology. Several scholars have applied the theory of TTF to evaluate information technology (IT) and DSS applications. As Zack (2007) stated, “The notion that technology should fit the task has become an accepted approach to evaluating the performance impacts of information technology” (p. 1671). The models of fit consider users’ evaluation as a relevant measure for DSS success (De-Haes & Van-Grembergen. 2009; Gelderman, 2002; Goodhue, 1998).

Howard and Rose (2019) refined the TTF theory to include task-technology misfit (TTM), which gives differing outcomes that are more than the inverse of TTF. Howard and Rose (2019) introduced two scales: the first is an 8-item one-dimensional TTF scale, and the second, an 18-item, three-dimensional TTF and TTM (TTF/M) scale, distinguishes between two forms of TTM (too little fit and too much misfit fit). Howard and Rose (2019) applied this new model to several cases, including the study of the impact of upgraded technology on TTF. This case matches the case of upgrading an ERP to an ERP-based DSS in the current study.

Procedure and Assumptions

To investigate empirically the research model of TTF and check the research hypothesis, a mixed methods approach was used to collect and examine data. Data was collected from 170 randomly selected ERP-based DSS professionals through an online survey. The data analysis was conducted in three phases: descriptive statistics and reliability analysis, multiple regression modeling and analysis, and partial least squares structural equation modeling (PLS-SEM).

The study was limited to individuals who identified themselves as having a DSS-related job function. It was assumed that survey participants understood all questions that were tested, which were mostly adapted from previous research, and that they responded accurately and truthfully. It was also assumed that the survey respondents had prior knowledge of ERP and ERP-based DSS before responding to the questions.

Organization of the Study

This dissertation includes nine sections. After this introduction, the second section reports on the literature review. In the third section, a professional review of the main ERP products, specifically regarding their decision-supporting functionality, is reported. Then, the theoretical framework and development of hypotheses are presented in the fourth section. The research methods and analysis of results are addressed in the fifth and sixth sections. Next, the discussion of results and potential contributions are presented in the seventh section. The eighth section addresses the limitations and opportunities for future research, and the ninth section presents the conclusion. The survey instrument, results of the Q-sorting test of survey items, and results of the pilot study are provided in Appendices A, B, and C, respectively.

Literature Review

To achieve a balanced fit of DSS with both business and ethical requirement attributes, one must first understand the decision-making process and the use of DSS, EDSS, and ERP-based DSS. Second, one must identify what types of business requirements are essential to DSS at the enterprise level. Third, one must identify what types of ethical requirements are essential to DSS at the enterprise level. Finally, one must define the architecture elements upon which to implement an ethics-governance-by-design approach in ERP-based DSS. The implications of the literature reviewed for the current study are discussed with apparent gaps highlighted in the following four paragraphs.

Decision Making, Decision Support Systems, Ethical Decision Support Systems, and Enterprise Resource Planning-based Decision Support Systems

Simon (1960) defined the decision-making process as "three principal phases: finding occasions for making a decision; finding possible courses of action; and choosing among courses of action" (p. 1). Cornell (1980) believed that decision making is the most important process engaged in by managers in all types of organizations. The primary focus of this current research is on strategic decision making. Bass (1983) showed that strategic decisions usually involve several dynamic and highly complex variables and result in significant impacts. Bass (1983) added, "Strategic decisions deal with the long-term health of the enterprise" (p. 16). Harrison (1996) defined five different criteria for use in making a strategic decision:

> (1) the decision must be directed towards defining the organization's relationship to its environment, (2) the decision must take the organization as a whole as the unit of analysis, (3) the decision must encompass all of the major functions performed in the organization, (4) the decision must provide constrained guidance for all of the administrative and operational activities of the organization, and (5) the decision must be critically important to the long-term success of the total organization. (p. 46)

As mentioned in the first criterion from Harrison (1996), strategic decisions are mainly oriented towards the relationship between the organization and its external environment. This relationship is represented by the concept of strategic gap, which depicts the fit between the capabilities of the organization and its corresponding environmental factors (Shirley, 1982). This concept is the main concern of the current study.

The DSS is considered a subfield of the information systems discipline that is focused on supporting the decision-making process. The DSS is "an interactive, flexible, and adjustable system which uses decision rules, models, and model base with a comprehensive database as well as the decision maker's own insights" (Kitsios & Kamariotou, 2016, p. 3). The role of DSS developers is to create a platform on which the human decision maker and the IT-based models and data sources can work together in an interactive mode to reach a decision. The decision may be an optimal decision or a satisficing decision. An optimal decision is the best possible decision. A satisficing decision is a feasible decision accepted by relevant stockholders (Simon, 1960).

As depicted in Figure 3, the system receives data from all available sources, including databases, data-warehouses, big-data sources, the Internet, and other documents. The system uses relevant models for each decision case (He & Li, 2017). A key part of the DSS is the decision makers themselves. The decision makers' insights are vital ingredients of system inputs (Kitsios & Kamariotou, 2016).

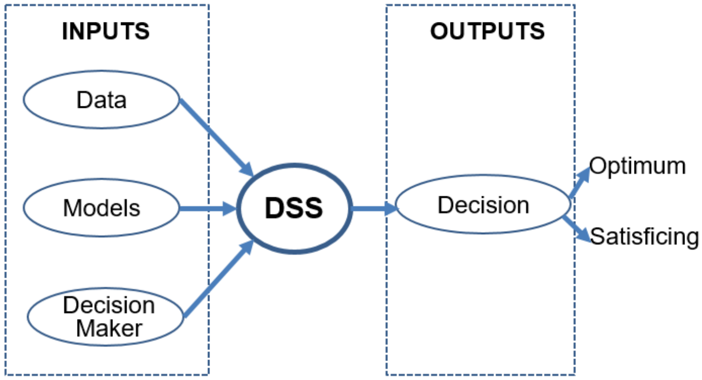

Figure 3. High-level architecture of decision support systems (DSS).

An EDSS is a DSS that contains an ethical model that can influence a user's ethical decision-making capability. An EDSS provides decision makers with guidance and restrictions for making decisions that reflect standard ethics and values (Mathieson, 2007). Carlson, Carlson, & Wadsworth (1999) and Salles (2015) showed how characteristics of EDSS design can improve the ethical aspects of decisions, as demonstrated in the paragraph of Ethics-Governance-by-Design in ERP-based DSS.

In their paper titled "An Architecture for Organization-Wide Decision Support Systems," Philippakis and Green (1988) classified DSS into four categories: local DSS (LDSS), functional DSS (FDSS), corporate planning systems (CPS), and executive information systems (EIS). If an ethics module is going to be added to an LDSS or an FDSS, the scope of ethical support will be restricted to an operational level, while if it is going to be added to a CPS or an EIS, the scope of ethical support will be on a strategic level.

Considering an organizational level of analysis for EDSS, the current research was oriented toward the organizational DSS (ODSS). Early studies, such as George (1992) and Fan, Liang, and Zeng (2006), defined ODSS in different ways. All definitions consider that the main purpose of an ODSS is to support decisions that are used on organizational levels and impact corporate strategies. Accordingly, if an ethics module is going to be added to an ODSS, the scope of ethical support will be on the strategic level, which was the level of analysis in the current research. Sena (2001), Shafiei and Sundaram (2004), and Stanek, Sroka, and Twardowski (2004) considered the main use of ODSS to be based upon ERP systems, such as SAP, Oracle-eBusiness-Suit, and Microsoft-Dynamics. The type of these systems is referred to as ERP-based DSS (Stanek et al., 2004).

An ERP system is commercial software that integrates the information flowing through all departments and supports strategic decisions at the enterprise level (Maas, van Fenema, & Soeters, 2014). The system consists of coupled applications providing decision makers with a holistic view of information within the organization, along with a seamless supply chain between the company, suppliers, and customers (Garg & Garg, 2014). According to Lin, Cole, and Dalkir (2014), an ERP system is the most significant decision-making tool. Nair, Reddy, and Samuel (2019) stated that "as ERP continues to evolve into a real-time planning tool, it will play a more strategic role in helping companies achieve their business objectives" (p. 827). Shang and Seddon (2000, p.1013) showed that ERP systems can facilitate business learning in three ways: facilitates learning by entire workforce, shortens learning time, and broadens employees' skills. Over the past three decades, a large number of organizations have implemented ERP systems (Koch & Mitteregger, 2016). Table 1 reviews articles that address the decision-support benefits of using ERP systems.

Table 1

Decision-Support Benefits of Using Enterprise Resource Planning Systems

Benefit	Reference
Decision participants working jointly, for inter-related decisions, and for decisions involving multiple organizations	Holsapple, Sena, and Wagner (2019)
Access to real-time business intelligence (BI)	Holsapple and Sena (2005)
Better knowledge processing Better coping with large/complex problems Reduced decision costs Stimulates fresh perspective Stimulates new approaches to thinking about a problem or a decision context substantiation Greater reliability	Holsapple and Whinston (1996) Shang and Seddon (2000)
Better coordination	DeSanctis and Gallupe (1987) Holsapple and Whinston (1996)
Greater exploration/discovery Reduced decision time Competitive advantage	Holsapple and Whinston (1996) Udo and Guimaraes (1994) Shang and Seddon (2000)
Better communication	DeSanctis and Gallupe (1987) Holsapple and Whinston (1996) Udo and Guimaraes (1994)
Greater satisfaction Productivity improvement Build business innovation Facilitate business learning and broaden employ skills	Udo and Guimaraes (1994) Shang and Seddon (2000)

In the paper titled “ERP and Its Impact on Decision Making,” Adam (2001) explained the differences between ERP and DSS. Adam (2001) showed that a DSS supports unstructured or semi-structured decisions utilizing computerized models that generate feasible or optimal solutions, while ERP systems focus on structured problems based upon the integration of activities across the organization. Despite the differences between DSS and ERP, several scholars have considered them dependent and indicate they should be integrated in a hybrid system or ERP-based DSS (Ittiphaisitpan, 2011). Stanek et al. (2004) showed that organizations that have implemented ERP systems are facing the challenge of incorporating new resources and experiences for decision support purposes. They suggest the construction of a hybrid DSS consisting of three components - analyzer, simulator, and communicator - within an organization that already has a functioning ERP system (Stanek et al., 2004). SAP has developed such components in their ERP system, as addressed in the paragraph of Decision-Supporting Functionality of SAP ERP.

Shafiei and Sundaram (2004) believed that ERP and DSS have independently evolved and prospered in the marketplace as well as in academia. Business intelligence (BI) and business analytics are decision support tools and technologies incorporated in ERP and related systems. At the same time, DSSs are taking advantage of the persistent data in ERP systems. This emerging convergence has motivated several researchers and practitioners to develop frameworks and architectures for ERP-based DSSs. Fazlollahtabar, Asadinejad, Shirazi, and Mahdavi (2013) suggested that in each subsector there should be a unique ERP module along with a DSS module, and on the organizational level, there should be a general DSS, which is responsible for integrating and normalizing corporate decisions. Such ERP-based DSS architecture is addressed in the paragraph of Ethics-Governance-by-Design in ERP-based DSS.

In ERP-based DSSs, many different types of ERP users with varied needs utilize the same data warehouse to retrieve the right information for the right decision (Sastry, Babu, & Prasada, 2013). A data warehouse is referred to as a large repository of historical data pertaining to an organization. The nature of a data warehouse includes integrated data, detailed and summarized data, historical data, and metadata. Integrated data enable the data mining tools to easily and quickly look across vistas of data. Online analytical processing (OLAP) refers to another technique of performing complex analysis of the information stored in a data warehouse. In the same respect, a neural network can be deployed to enhance the intelligence level of the OLAP application. A neural network searches for hidden relationships, patterns, correlations, and interdependencies in large databases.

Several ERP systems offer algorithms that aid data association, classification, regression analysis, and clustering (Sastry et al., 2013). Data association algorithms leverage the analysis of the relationship between two data sets; through such analysis, businesses are able to discern the patterns in data occurrence. This enables businesses to use the existing ERP data to undertake predictive analytics to determine the kinds of outcomes that must be expected after the application of certain sets of strategies (Sastry et al., 2013).

The use of algorithms such as autoregressive integrated moving average (ARIMA) also leverages sales and marketing departments' forecasting capabilities (Gordon & Linoff, 2010). While applying mainly customer relationship management (CRM) data to customer behaviors, the ARIMA algorithm aids the effectiveness of sales forecasting using time series analysis. The results of such analysis enable supply chain managers to review and adopt the appropriate strategies for aligning supply with demand (Gordon & Linoff, 2010). In the event that sales are predicted to decline, such data analytics may also influence the development and application of strategies that improve customer attraction and retention (Better, Glover & Laguna, 2007). Besides data association algorithms, ERP also can offer critical data for the use of data classification algorithms. Data classification algorithms aid the classification and comparing and contrasting of different groups of data (Gordon & Linoff, 2010). This is useful for benchmarking the performance of various departments, as well as benchmarking the firm's performance with its competitors.

The state-of-the-art trend in ERP is a cloud-based ERP system (Amani & Fadlalla, 2016). The cloud-based operation model has brought a new software abstraction layer over the already existing data center model, which covered all the middleware, operating system, and database level architecture elements (Orosz, Selmeci, & Orosz, 2019).

Technology enabled adoption (TEA) allows firms to enhance initially adopted technologies. Nwankpa (2019) defined ERP-enabled adoption as adoption that occurs after the initial deployment of an ERP system, which allows for the integration of subsequent technologies. Adoption that is ERP-enabled may include external systems that can extend functionalities such as an EDSS module in the current study. Such integration of ERP and DSS in ERP-based DSS brings about the ability to incorporate an ethical module in DSS that improves its task-technology-balanced fit, as addressed in the paragraph of Ethics-Governance-by-Design in ERP-based DSS.

Categories of Business Requirement Attributes of Decision Support Systems at the Enterprise Level

The current study addressed four categories of business requirement attributes to provide support for the organization's strategic decisions. The four categories were defined according to the four perspectives of the balanced scorecard (BSC; Kaplan & Norton, 1996): financial, customer, business processes, and learning and growth. The learning and growth perspective was considered in this study as organizational learning and innovativeness.

The BSC has been used in several types of research for measuring and supporting organizational strategies (Mehralian, Nazari, & Ghasemzadeh, 2018). Al-Hosaini and Sofian (2015) recommended the use of the BSC and its four perspectives to improve organizational performance. Gupta and Salter (2018) found that organizations that are future- and performance-oriented have higher levels of BSC usage than others. The current study used the BSC approach for categorizing the business requirement attributes of using the DSS at the enterprise level.

According to the first perspective of the BSC, the financial requirement attribute (FA) in DSS focuses on decisions related to the rise of the return on investment (ROI), the return on equity (ROE), and the return on assets (ROA; Kaplan & Norton, 2008). The FA measures adapted from Prasad and Green (2015, p. 16) are the role of DSS in supporting: (a) decisions of improving the company's ROI, (b) decisions of improving the company's ROE, and (c) decisions of improving the company's ROA.

According to the second perspective of the BSC, the customer requirement attribute (CA) focuses on supporting decisions of increasing the value expected by the customers regarding products, services, and experience of transactions (Kaplan & Norton, 2008). Kaplan (2010) showed that the value offered to customers is a result of the product, price, service, relation, and image that a business can offer; such value results in customers' loyalty and retention. The CA measures adapted from Prasad and Green (2015, p. 16) are the role of DSS in supporting: (a) decisions that improve the customer's perception of the company's quality of products, (b) decisions that improve the customer's perception of the company's quality of services, and (c) decisions that improve the customer's satisfaction in general.

According to the third perspective of the BSC, the business process requirement attribute (BP) focuses on supporting decisions of continuous improvement of business processes regarding productivity and cycle times of production and customer services. Melville, Kraemer, and Gurbaxani (2004) showed that a business process is a sequence of activities across time and space with identified inputs and outputs. The value chain of each process allows the selection of performance indicators (Jordão & Novas, 2013; Kaplan & Norton, 2008; Sen, Bingol, & Vayvay, 2017). The BP measures adapted from Prasad and Green (2015, p. 16) are the role of DSS in supporting: (a) decisions that improve the company's productivity, (b) decisions that improve production cycle times, and (c) decisions that improve timelines of customer service.

According to the fourth perspective of the BSC, the learning and innovativeness requirement attribute (LI) focuses on supporting decisions of developing structures that can make the growth of the enterprise viable. Jordão and Novas (2013) showed that the ability of an organization to innovate, to improve, and to learn is related directly to enterprise performance. Such a requirement attribute includes two requirement sets: organizational learning (García-Morales, Lloréns-Montes, & Verdú-Jover, 2006; Kale, Singh, & Perlmutter, 2000; Vishwanath & Sankaranarayanan, 2017) and organizational innovativeness (García-Morales et al., 2006; Verdú, Tamayo, & Ruiz-Moreno, 2012). The organizational LI measures adapted from García-Morales et al. (2006, p. 41), Kale et al. (2000, p. 237), and Verdú et al. (2012, p. 588) are the role of DSS in supporting: (a) decisions that enhance the company's existing capabilities and skills, (b) decisions that improve the rate at which the company introduces new products or services, and (c) decisions that improve the rate at which the company introduces new methods of production or services.

Categories of Ethical Requirement Attributes of Decision Support Systems at the Enterprise Level

Courtney (2001) concluded that a new paradigm for decision making is needed for updating the design of DSS. Courtney (2001) suggested that instead of going directly to the business perspectives in a decision-making process, multiple perspectives should be considered first; and the multiple perspectives, including ethical issues, can provide a more comprehensive insight into the problem definition and increase possible alternatives. Chae et al. (2005) argued that Courtney's (2001) work failed to explain how non-business perspectives, including ethical attributes, would be implemented in the system. The current research participated in addressing this gap by investigating the impact of achieving a balanced fit with both ethical and business requirement attributes in DSS design on perceived system performance.

The current study addressed four ethical requirement attributes of DSS design to provide support for the organization's strategy at the enterprise level: social responsibility (SR), moral intensity (MI), stakeholders' involvement (SI), and code of ethics (CE). These four attributes have been the most referred to in literature of business ethics (O'Fallon & Butterfield, 2005; Trevino & Nelson, 2016; Weber & Wasieleski, 2013).

The relationship between SR and corporate performance has been investigated by several researchers. Sroufe and Gopalakrishna-Remani (2018), Chelliah, Jaganathan, and Chelliah (2017), and Branco and Rodrigues (2007) showed evidences of a positive relationship between SR and corporate performance. The Global Reporting Initiative (GRI) provides standard measures of social practices of corporations at the international level (Gómez-Navarro, García-Melón, Guijarro, & Preuss, 2018). The SR requirement attribute measures adapted from Kim and Ferguson (2014, p. 6) are the role of DSS in supporting: (a) decisions for identifying the company's motives or intentions for doing activities of SR, (b) decisions for evaluating what the company wants to achieve by undertaking activities of SR, and (c) decisions for determining how long a company has to support its initiatives of SR.

The attribute of MI is the core of the ethical decision-making process in any business. Hwang, Lee, Kim, Zo, and Ciganek (2016) showed that moral beliefs explain deviant online behavior, including individual flaming, in virtual communities. In the field of accounting, the American Accounting Association (AAA) model has been used for guiding ethical decision making (Langenderfer & Rockness, 2006). The AAA model includes a seven-step process:

1. Identifying the facts of the case,
2. Determining the moral issues in the case,
3. Identifying the ethical norms and the values related to the case,
4. Developing alternative courses of action,
5. Evaluating the alternative courses of action,
6. Predicting the consequences of the outcomes, and
7. Explaining the decision taken.

Jones (1991) proposed the MI model to describe the characteristics of a moral issue; the model is composed of six components: the magnitude of consequences, social consensus, temporal immediacy, the probability of effect, proximity, and concentration of effect. The MI measures adapted from McMahon (2002, p. 120) are the role of DSS in supporting: (a) decisions for determining the negative consequences (if any), the probability of effect, and the concentration of effect of a decision; (b) decisions for exploring the social consensus on what the appropriate decision is and the proximity of effect; and (c) decisions for identifying the time range of consequences to show up.

The third requirement attribute of SI in DSS design is supported by Boland (1987). Boland (1987) believes that designing a DSS is a moral problem because it puts the system designer in the position of imposing a solution on several stakeholder parties. Whenever one party's interest affects the interest of another party, an ethical issue arises (Mason, 1995). Brown, Dacin, Pratt, and Whetten (2006) believed that corporate reputation is a set of beliefs held by diverse stakeholders representing what they think about the organization. The problem in decision making is the balancing of different perceptions of stakeholders. Different stakeholders have different priorities that affect levels of balance in DSS. The SI measures adapted from Atuheire (2018, p. 60) are the role of DSS in supporting: (a) decisions for developing SI guidelines, (b) decisions for enabling stakeholders to work together as partners, and (c) decisions for promoting mutual respect and trust amongst stakeholders.

The fourth ethical requirement attribute in DSS design is the CE, which has been widely investigated in the business ethics literature because of the significant relationship with ethical decisions (O'Fallon & Butterfield, 2005). The CE is defined by Stevens (1994) as "written documents through which corporations hope to shape employee behavior and produce change by making explicit statements as to desired behavior" (p. 64). Having a CE in an organization can help provide important guidance for employee behavior (Pater & Van Gils, 2003). However, Menon (2014) showed that the existence of a CE does not always have an impact on the subject who is willing to engage in unethical actions. Menon's (2014) findings highlight the need for ethical laws. Ethical laws, along with a professional CE in a DSS, will protect decision makers and organizations from both professional and legal consequences of unethical decisions. The CE measures adapted from Svensson, Wood, Singh, and Callaghan (2009, p. 261) are the role of DSS in supporting: (a) decisions for verifying that the CE is available for all stakeholders, (b) decisions for identifying the consequences for a violation of the CE, and (c) decisions for ensuring the CE guides a company's strategic planning.

Ethics-Governance-by-Design in Enterprise Resource Planning-based Decision Support Systems

The current study adopted an ethics-governance-by-design concept in which testing the ethical feasibility was conducted in parallel with business issues. In such a way, the ethical feasibility of each alternative was evaluated in all phases of decision support.

The word governance is associated with words like governing, government, and control (Klakegg, Williams, Magnussen, & Glasspool, 2009). In the context of this current study, control means being able to define limitations, to decide, or to delegate authority. The governance term's rise to prominence stems from the difficulties of hierarchical coordination in firms and states (Miller & Lessard, 2000). Oakes (2008) defined governance as being about who is allowed to make which decisions and what constitutes due process for making such decisions. The concept of governance has been used widely in different contexts and fields, including IT governance (De-Haes & Van-Grembergen, 2009; Prasad & Green, 2015). The needs for accountability and transparency have initiated the idea of the term governance not only in the organization and corporate world but also in individual projects and IT applications. Rhodes (1997) defined governance as a non-hierarchical form of steering, where state and non-state actors participate in the formulation and implementation of public policy. This means that also on the corporate level, accountability and transparency must be implemented so that each stakeholder can participate in the formulation of policies and decision making.

Corporate governance involves a set of relationships between a company's management and its stakeholders. In the process of defining corporate governance, corporate responsibility may be defined by means of a shareholder theory that describes the primary responsibility of the directors of a company to act in the interest of its shareholders (How, Lee, & Brown, 2019). In this theory, companies should look after their stakeholders, including suppliers, customers, members of staff and the environment, or the shareholder value is likely to suffer (How et al., 2019). So, a well-run company's board will have to deal with these interests of stakeholders to ensure long-term corporate health and shareholder value.

Brans (2002) suggested a model for incorporating ethical aspects into business optimization. Brans's (2002) idea is based on assigning weights to vectors that represent different options in a multi-dimensional space of all criteria and then transferring these vectors onto a two-dimensional plane of candidate alternatives. The idea of assigning relative weights supports the current research's approach of balancing the relative weights of business and ethical requirement attributes fit in DSS.

Maner (2002) conducted extensive research on reviewing and classifying 60 different procedures for ethical decision making. Maner (2002) summarized this work in a 12-stage process that represents a checklist for evaluating an ethical decision-making system; the 12 stages could be grouped into four categories:

1. Defining moral aspects of the problem
2. Defining conflicting interests of stakeholders
3. Developing alternative options with cost-benefit-risk, and
4. Selecting an option and controlling its implementation.

The classification of these four categories is consistent with the four ethical requirement attributes in the proposed architecture of DSS (Figure 5).

Carlson et al. (1999) suggested an EDSS architecture that consists of two models: ethical and business models. The two models work in a sequence as depicted in Figure 4. The ethical model starts with recognizing the ethical issue. If the model shows that the decision does not involve an ethical issue, the system is transferred to the business model to support business aspects of the decision. If the ethical model shows that the decision involves an ethical issue, the model continues to support an ethical evaluation according to the MI (Jones, 1991) and ethical judgment according to the cognitive moral development level (Kohlberg, 1981).

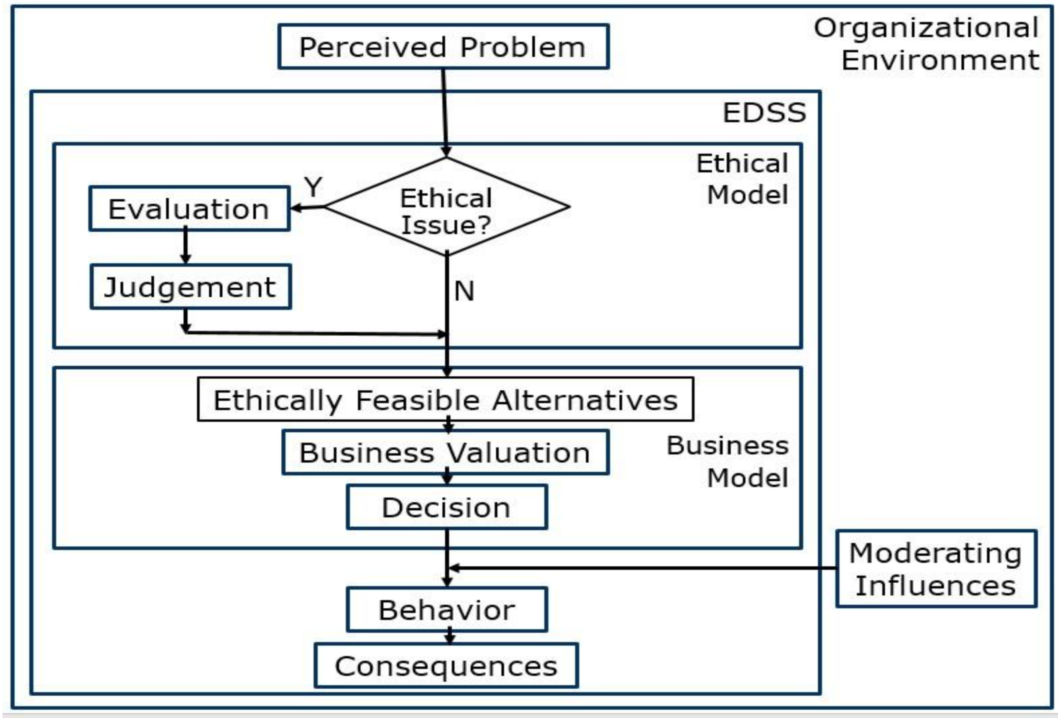

Figure 4. Ethical decision support system design architecture. Adapted from Carlson et al. 1999, p. 188.

Based on the ethical evaluation and judgment, the model forwards a set of ethically acceptable alternatives to the business model, which continues supporting business aspects of the decision. This architecture illustrates a new concept of testing the ethical feasibility of decision alternatives first before conducting a business analysis on them.

Mulligan and Bamberger (2018) believed that “governing through technology has proven irresistibly seductive… the purposeful effort to use technology to embed values is becoming a central mode of policymaking” (p. 697). Mulligan and Bamberger (2018) also stated that “designing technology to ‘bake in’ values offers a seductively elegant and effective means of control. Technology can harden fundamental norms into background architecture” (p. 701).

Figure 5 depicts the proposed model that includes two modules for representing ethical attributes along with business attributes. As depicted in Figure 6, the proposed model can be implemented in a traditional ERP model by adding the two proposed modules for modeling ethical attributes and business attributes to an ERP’s central database (Davenport, 1998). The main role of the ethics module is to guide or restrict the decision maker’s judgment on ethical issues. Silver (1991) described three types of decision guidance. The first is the sequence in which information is presented to consider ethical issues that are appropriate to the decision context (Silver, 1991). The second is a set of relevant help messages that give some warnings in context, and the third is to recommend certain ethically feasible responses as an advisor (Silver, 1991). The restrictiveness of DSS refers to the constraints imposed by the available functionality of the system (Carlson et al., 1999).

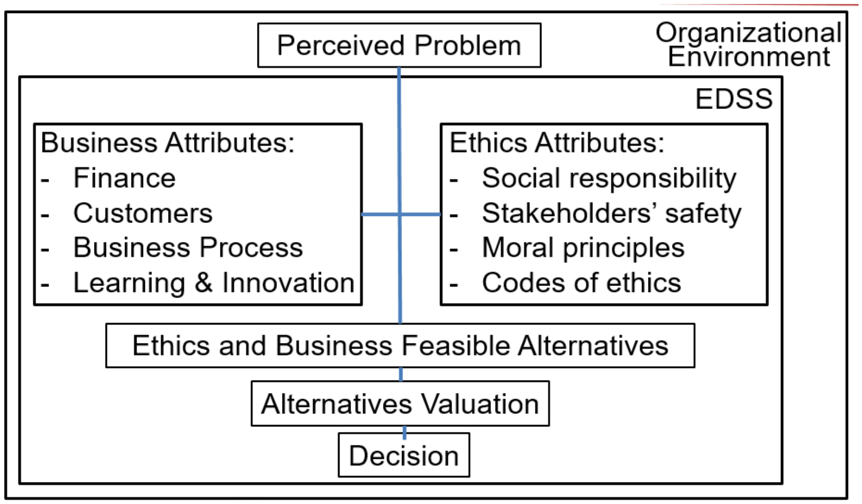

Figure 5. Proposed model of ethics-governance-by-design in enterprise resource planning-based decision support systems.

Several checks may be conducted in the ethics module (Carlson et al., 1999; Ethics & Compliance Initiative, 2018; Yusuph, Guohua, & Abeid, 2016), such as: Is the decision consistent with our organization's policies, procedures and guidelines? Is it acceptable under the applicable laws and regulations? Does it conform to the universal principles or values our organization has adopted? Does it satisfy the decision maker's personal definition of right, good and fair? Is there a conflict of interest with any of the potential suppliers? Does each supplier conform to an ethical code of ethics that is consistent with our organization's code? Does any potential supplier have a history of being taken to court for unethical or illegal business practices?

As an example, in the case of deploying SAP's ERP product, the proposed modules may be implemented using SAP Business Information Warehouse (SAP-BW), Strategic Enterprise Management (SAP-SEM), and Advanced Business Application Programming (SAP-ABAP), in addition to the interfaces with other third-party DSS tools (Missbach et al., 2016).

Consequently, in addition to the literature review, there is a need also to review professionally the available ERP products from key vendors working in the United States to evaluate their capability of supporting decisions in the two categories of ethical and business requirement attributes as addressed in the following section.

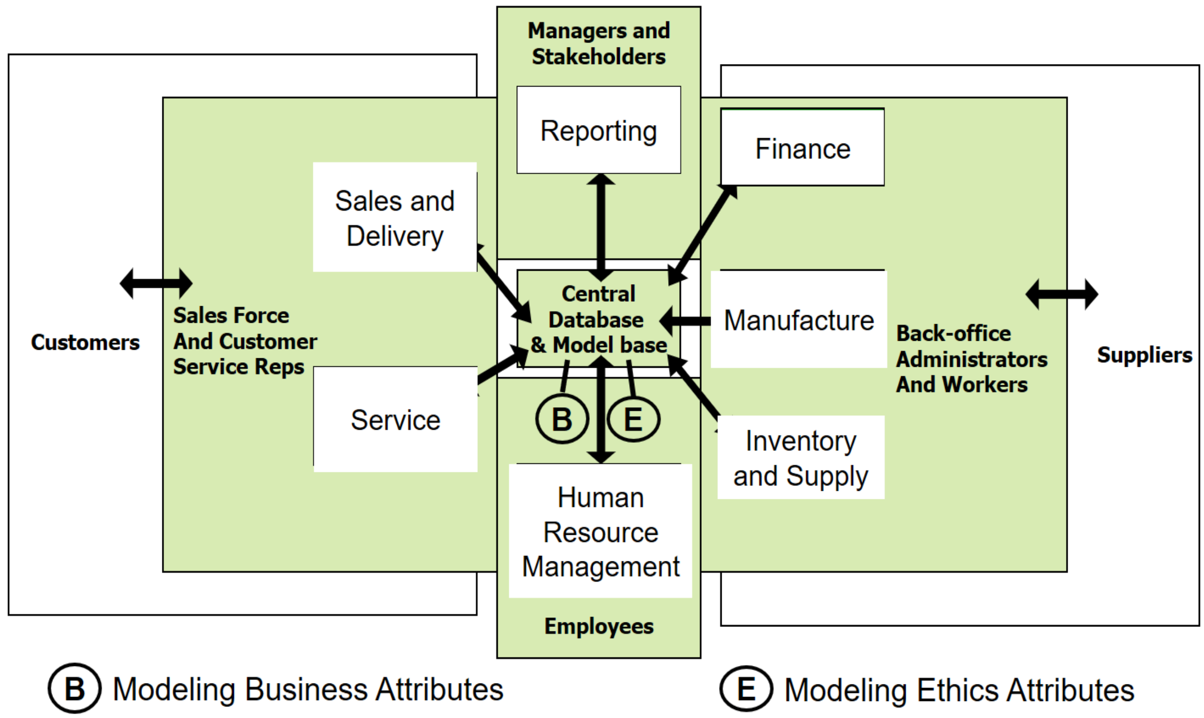

Figure 6. Proposed model of incorporating an ethics module in enterprise resource planning system

Decision-Supporting Functionality of Commercial Enterprise Resource Planning Products

This section reports on a professional review of key commercial ERP vendors and their competence in supporting decisions in the two categories of ethical and business requirement attributes addressed in previous section. To get more details of decision-supporting functionality of commercial ERP products, there was a need to turn to vendors' sites, catalogs, and white papers for a professional review. Although functionality provided by vendors may exaggerate product strength and omit shortcomings, the purpose of this section is to build a broad list of possible decision-supporting functionality from key ERP vendors working in the United States.

The Global ERP Software Market Report from MarketWatch (2019) offered a comprehensive vision for studying the ERP market. The report was derived through primary and secondary statistics sources about key players, including SAP SE (Germany), Oracle Corporation (United States), Microsoft Corporation (United States), Epicor Software Corporation (United States), Infor (United States), and Sage Group plc (United Kingdom). These six vendors are the same vendors used in the empirical study of this dissertation and are also used in similar dissertation surveys, such as Oldacre (2016, p. 160).

Rusu and Gerőcs-Szász (2018, p. 251) showed that the ERP marketplace is dominated by SAP and Oracle, but both have serious impediments for highest price and complexity. Microsoft is another competitor with its Microsoft Dynamics—an ERP system fit for Windows systems and for companies using Microsoft Project and financial software. All are fit for large companies. For small and medium companies, there is Infor, Epicor, and Sage. The ERP products of the six key vendors are reviewed regarding their decision-supporting functionality in the following six paragraphs.

Decision-Supporting Functionality of SAP Enterprise Resource Planning

Based in Walldorf, Germany, SAP offers a wide range of business applications. SAP S/4 HANA Cloud is its leading cloud ERP product. Despite the fact that many of SAP customers use its legacy product, the SAP Business Suite, SAP S/4HANA Cloud is now SAP's main focus for competing in the market of cloud business management suites (MarketWatch, 2019).

According to Gartner Research's (2015) report, SAP is among the most robust current release offerings for artificial intelligence and machine learning (AI/ML) functionality of all vendors in the report. According to its reference customers, its embedded reporting capabilities are strong and can be extended with SAP Analytics Cloud (Gartner Research, 2015). SAP S/4HANA Cloud uses its proprietary in-memory database (SAP-HANA) to improve analytics, with a focus on real-time decision making and an ability to provide a single database to manage business processes (Gartner Research, 2015).

Functional SAP ERP modules include Human Resource Management (SAP-HRM)—also known as Human Resource (SAP-HR), Production Planning (SAP-PP), Material Management (SAP-MM), Financial Supply Chain Management (SAP-FSCM), Sales and Distribution (SAP-SD), Project System (SAP-PS), Financial Accounting and Controlling (SAP-FICO), Plant Maintenance (SAP-PM), and Quality Management (SAP-QM), along with the ability for integration of SAP ERP modules. Each one of these modules has several submodules.

Technical SAP ERP modules include Advanced Business Application Programming (SAP-ABAP), Information Systems Management (SAP-IS), Customer Relationship Management Technical module (SAP-CRM), and Solution Manager (SAP-SM). The SAP-ABAP module is a special-purpose, fourth-generation language developed by SAP and used to write programs for specialized requirements of creating custom user-defined functions, including algorithms for supporting ethical requirement attributes.

SAP Business Suite applications include Government, Risk and Compliance (SAP-GRC), SAP Strategic Enterprise Management (SAP-SEM), and SAP Compliance Management for service-oriented architecture (SAP-SOA). The SAP-SEM module is structured functionally into five components: Business Planning and Simulation (SAP-SEM-BPS), Corporate Performance Monitor (SAP-SEM-CPM), Business Consolidation (SAP-SEM-BCS), Business Information Collection (SAP-SEM-BIC), and Stakeholder Relationship Management (SAP-SEM-SRM).

SAP Advanced Components include SAP Business Warehouse (SAP-BW) and SAP Advanced Planning and Optimization (SAP-APO). The SAP-BW module collects, transforms, and stores data generated in SAP and non-SAP applications and makes it accessible through built-in tools, including an OLAP engine and third-party software.

According to the vendor's catalog, the decision-supporting functionality of SAP ERP includes the following:

1. Supporting decisions related to financial aspects using all functional SAP ERP modules, integrated to the SAP-FICO module.
2. Supporting decisions related to customer aspects using all functional SAP ERP modules, integrated to the SAP CRM module.
3. Supporting decisions related to business process using SAP PP, SAP MM, SAP PS, SAP PM, and SAP QM.
4. Supporting decisions related to organizational learning and innovativeness using SAP-APO and SAP-SEM modules.
5. Supporting decisions related to SR using SAP-SEM, SAP-BW and SAP-ABAP.
6. Supporting decisions related to MI using contextual checklists built into different modules using the SAP ABAP module to write programs for MI support.

7. Supporting decisions related to SI using the SAP IS and the SEM-SRM modules.
8. Supporting decisions related to CE using the new GRC module that is built on a SOA to enable enterprise-wide gathering, consolidation, and presentation of relevant operational information for risk management and compliance efforts.

Reviewing the decision-supporting functionality of SAP ERP shows high potential for achieving a balanced fit with both business and ethics requirement attributes in strategic decision making.

Decision-Supporting Functionality of Oracle Enterprise Resource Planning

NetSuite was founded in 1998 to provide web-based ERP applications and was one of the first vendors to develop multi-tenant software through a service (SaaS) business applications (MarketWatch, 2019). In November 2016, it was acquired by Oracle, where it has been operated as an independent global business unit. Oracle has focused on research and development (R&D) efforts, particularly with the integration into business analytics and AI/ML. Oracle offers a number of ERP solutions, including Oracle ERP Cloud, which is a suite of core management capabilities that includes an accounting hub, revenue management, project management, procurement, supply chain, and risk management. The cloud platform of Oracle enables partners and users to extend, customize, and integrate their applications, including DSS (MarketWatch, 2019). The two-tier ERP model powered by NetSuite helps clients preserve their on-premises ERP investments in SAP or other systems while integrating with global subsidiaries that are using Oracle's cloud-based ERP system (MarketWatch, 2019).

The Oracle ERP functional modules comprise several applications. Financial applications consist of several modules including general ledger, accounts payable, accounts receivable, fixed assets, and projects management. Manufacturing applications consist of several modules including bills of material, engineering, work in process, cost management, material requirements planning, master production scheduling, and capacity planning. Supply Chain Management (SCM) applications consist of purchasing, order management, and inventory modules. Human resources applications consist of human resource, payroll, and advanced benefits modules. CRM application allows for keeping track of all customer and lead data within the ERP solution. The insights gained from a CRM could help optimize a company's marketing and sales efforts. The BI application collects and analyzes data, provides actionable insights related to business processes, and delivers those insights in comprehensive reports. Inventory management system works in tandem with the SCM component but also keeps track of other processes, such as sales and warehousing. The main purpose of these components is to manage order fulfillment and stocking a warehouse.

According to the vendor's catalog, the decision-supporting functionality of Oracle ERP includes the following:

1. Supporting decisions related to financial aspects using all Oracle ERP components, integrated to the financial component of the Oracle ERP.
2. Supporting decisions related to customer aspects using all functional Oracle ERP components, integrated to the Oracle CRM component.
3. Supporting decisions related to business process using the Oracle manufacturing applications, including engineering, work in process, cost management, material requirements planning, master production scheduling, and capacity planning components.
4. Supporting decisions related to organizational learning and innovativeness using the Oracle human resources application along with the advanced benefits component.
5. Supporting decisions related to SR using the Oracle BI component, Oracle BW, and PL/SQL programming tools.

6. Supporting decisions related to MI, decisions related to SI, and decisions related to the conformance to CE using contextual checklists that are built into different components using advanced programming tools such as the PL/SQL programming language.

Reviewing the decision-supporting functionality of Oracle ERP shows high potential for achieving a balanced fit with both business and ethics requirement attributes in strategic decision making.

Decision-Supporting Functionality of Microsoft Dynamics Enterprise Resource Planning

Microsoft bought Great Plains and Navision to gain a position in the ERP market. As a part of the product road map for its Dynamics brand, Microsoft built more commonality into its ERP suites. The first areas of commonality are user interface and add-on applications like CRM and Microsoft Project. Using the .NET development framework, the infrastructure for the company's suites became common (Gartner Research, 2015).

The Microsoft Dynamics rebranding is the result of the rationalization of Microsoft's acquisition of mid-size ERP vendors Axapta, Great Plains, Navision, and Solomon. The addition of Dynamics CRM to the mix gave Microsoft solutions for a broad spectrum of enterprise operations (MarketWatch, 2019). Microsoft claims to have some leading functionality in making innovative use of technology with embedded power BI and utilizing AI/ML in its cloud ERP offerings.

A recent version of Microsoft Dynamics 365 is a customizable, scalable, and global ERP software solution that supports connectivity with different platforms in the business community. Microsoft Dynamics 365 is a comprehensive business management solution for mid-sized and larger organizations that work with familiar Microsoft software (Gartner Research, 2015).

The company claims that its BI technologies provide Microsoft Dynamics 365 with a multi-language, multi-currency ERP business solution with comprehensive business management features for financial, human resources, and operations management, as well as additional industry capabilities for retailers, professional service industries, financial service businesses, manufacturers, and public sector organizations (MarketWatch, 2019).

The monitoring and alerts feature in Microsoft Dynamics 365 help managers across an organization to quickly and easily create alert rules that deliver automatic notifications of changes and events that are critical to their jobs. This facility could be used for checking some ethical rules and restrictions (MarketWatch, 2019).

The system is configured with embedded workflows based on Microsoft Windows workflow foundation. It keeps a business continuously running for employees, customers, vendors, and other business partners. The enterprise portal in Microsoft Dynamics 365 provides role tailored data and business processes in real time over the web, with full support for Intranet, business-to-consumer, and business-to-business communications (Gartner Research, 2015).

The main components of Microsoft Dynamics 365 are integrated with other Microsoft applications, as illustrated in Table 2.

Table 2

Microsoft Dynamics 365 Enterprise Resource Planning Components Integrated with other Microsoft and Third-Party Applications

<table>
<tr><th>Interface
Tier I</th><th>Interface
Tier II</th><th colspan="2">Microsoft Dynamics 365 ERP Components</th><th>Interface
Tier III</th></tr>
<tr><td rowspan="3">Office
365</td><td rowspan="3">Power
Business
Intelligence</td><td>Finance
Field Service</td><td>Sales
Marketing</td><td rowspan="3">Third Party
Business
Application</td></tr>
<tr><td>Customer Service</td><td>Project Service Automation</td></tr>
<tr><td>Operations</td><td>Business Intelligence</td></tr>
</table>

According to the vendor's catalog, the decision-supporting functionality of Microsoft Dynamics ERP includes the following:

1. Supporting decisions related to financial aspects using all functional Microsoft Dynamics 365 ERP components, integrated with the finance component.
2. Supporting decisions related to customer aspects using all functional Microsoft Dynamics 365 ERP components, integrated with the customer service component.
3. Supporting decisions related to business process using the operations, field service, and project service automation components.
4. Supporting decisions related to organizational learning and innovativeness using Microsoft Dynamics 365 marketing, operations, and project service automation components.
5. Supporting decisions related to SR using the Microsoft Dynamics 365 marketing component, along with some third-party application of multi-criteria decision making such as Expert Choice (Saaty, 2008) in selecting among alternatives of SR initiatives.
6. Supporting decisions related to MI, decisions related to SI, and decisions related to CE using contextual checklists that are built into different modules using .Net programming tools, the power BI application, and some relevant third-party business applications.

Reviewing the decision-supporting functionality of Microsoft ERP shows high potential for achieving a balanced fit with both business and ethics requirement attributes in strategic decision making.

Decision-Supporting Functionality of Epicor Enterprise Resource Planning

Epicor ERP is a solution with functionality for accounting, inventory control, pre-production materials planning, and manufacturing execution (MES). The system is delivered on-premises, hosted, or offered as a cloud-based SaaS offering. Epicor ERP can be deployed in a single site or multi-site, multinational enterprise (MarketWatch, 2019).

Epicor ERP consists of several modules. The CRM module manages leads, customers, contacts, and quotes from opportunity to order. The planning and scheduling module anticipates and responds to changes in customer demand to minimize downtime and disruption. The human capital management module manages the global workforce from recruitment to retirement and builds a culture of growth. The financial management module manages financial operations and gains insights into performance, expense, and risk. The service and asset management module coordinates service processes to provide resources and materials at the right time, for the lowest cost. The product management module improves collaboration between engineering, procurement, production, sales, and quality assurance teams. The demand planning and scheduling module produces accurate estimates, streamlines the order-to-cash cycle, and fulfills orders flawlessly. The enterprise content management module captures, stores, manages, and retrieves a company's documents and content anytime on any device. The project management module plans and executes simple or complex multi-level projects with costing and billing requirements. The BI and analytics module provides greater visibility for a company and helps it make better decisions. The production management module simplifies processes, reduces waste, and improves profitability regardless of product complexity. The SCM module manages all aspects of supply chain efficiently from forecasting to fulfillment. The enterprise risk management module enables compliancy and ensures that employees and partners are aware of non-compliance risks. The eCommerce solutions module offers customers a modern digital shopping experience with eCommerce solutions.

According to the vendor's catalog, the decision-supporting functionality of Epicor ERP includes the following:

1. Supporting decisions related to financial aspects using all functional Epicor ERP modules, integrated to the financial management (Epicor-FM) module.
2. Supporting decisions related to customer aspects using all functional Epicor ERP modules, integrated to the Epicor CRM module.
3. Supporting decisions related to business processes using production management, product management, and planning and scheduling modules.
4. Supporting decisions related to organizational learning and innovativeness using BI and analytics, enterprise content management, service and asset management, and human capital management modules.
5. Supporting decisions related to SR using BI and analytics, project management, and sales management modules, along with some multi-criteria decision making add-ons from a third party for selecting among alternatives of SR initiatives (Saaty, 2008).
6. Supporting decisions related to MI using contextual checklists that are built in different modules using a third-party fourth-generation language to write programs for specialized requirements, including algorithms for MI support.
7. Supporting decisions related to SI using the SCM, BI and analytics, and enterprise content management modules.
8. Supporting decisions related to CE using the enterprise risk management module and using contextual checklists built in different modules using a third-party fourth-generation language to write programs for specialized requirements including algorithms for insuring conformance to CE.

Reviewing the decision-supporting functionality of Epicor ERP shows high potential for achieving a balanced fit with both business and ethics requirement attributes in strategic decision making.

Decision-Supporting Functionality of Infor Enterprise Resource Planning

Infor ERP solutions for enterprise-level and small and medium-sized businesses have been active in the market for more than 30 years. Infor believes in a portfolio of ERP solutions aimed at different verticals but sharing a common service-oriented architecture so that add-ons like BI can be integrated in a consistent way. Currently, the company offers industry-specific CloudSuite solutions for businesses of all sizes. The company strategy is to buy up vendors that complement its own offerings, such as Lilly Software and Datastream. Its recent buy of rival SSA Global makes Infor the third-largest supplier in the midsize ERP market that supports on-premises and multi-tenant cloud deployments (MarketWatch, 2019).

Infor offers a new software product called Enterprise Performance Management (EPM) that is integrated with its ERP. The company claims that by integrating Infor-EPM with its Infor ERP system, the following decision-supporting functionalities could be achieved:

- Support of ERP system users with a robust analytical engine that translates data collected from accounts payable, accounts receivable, fixed assets, purchasing, and inventory control systems, giving decision makers valuable insight into the overall health of their organization.
- Leverage of advanced analytics to give finance teams the tools needed for value-added decision support, with insight into key areas such as financial consolidation, reporting, budgeting, and forecasting.
- Automation of data consolidation for financial closing and reporting activities.

- Consolidation of a company's data into a single repository that provides enhanced reporting through financial intelligence of underlying metadata, integrated financial statements, creation and management of key performance indicators (KPIs), and presentations.
- Analysis of operational and tactical data in dashboards and BSCs, and the unlocking of valuable operational data in an ERP system, which helps to make more informed decisions across the enterprise.
- Integration of isolated operational and financial data into a single repository, which helps ensuring that a company's business decisions and resource planning functions are based on the most accurate data and reflect the most complete view of enterprise.

Infor ERP consists of several modules. Infor ERP service management module is designed to help balance customer satisfaction, resource utilization, and profitability. Infor ERP lean manufacturing module is geared towards balancing inventory levels and global supply chains with improved performance, quality, and customer satisfaction. Infor's concept of lean includes the processes of suppliers, customers, logistics, and partners. Infor ERP quality management module helps order-driven manufacturers balance productivity, quality assurance, customer satisfaction, and profitability. Infor ERP financials module helps manufacturing organizations standardize their financials rules to accommodate single-country and multi-country accounting practices, taxation systems, and compliance. Infor ERP human resources module helps to manage the workforce from recruitment to retirement within a culture of growth. Infor ERP manufacturing module enhances the ability to balance customer satisfaction with efficiency and profitability. Infor ERP process module offers process capabilities designed to increase revenue, improve quality, and ensure compliance as defined by domain experts. Infor ERP wholesale and distribution module is tailored to balance customer demand, complementary product lines, and profitability, thus maintaining a competitive edge within a dynamic environment. Infor ERP project-based manufacturing module helps find the earned value of every project and provide an accurate cost estimate to ensure on-time and on-budget delivery while monitoring changes in cash flow.

According to the vendor's catalog, the decision-supporting functionality of Infor ERP includes the following:

1. Supporting decisions related to financial aspects using all functional ERP modules, integrated to the financial module.
2. Supporting decisions related to customer aspects using mainly the service management, lean manufacturing, quality management, and wholesale and distribution modules.
3. Supporting decisions related to business process using mainly the lean manufacturing, quality management, manufacturing, process, wholesale and distribution, and project-based manufacturing modules.
4. Supporting decisions related to organizational learning and innovativeness using mainly the human resources, service management, lean manufacturing, and quality management modules.
5. Supporting decisions related to SR using mainly the service management, lean manufacturing, quality management, and financials modules, along with other third-party multi-criteria decision making applications for selecting among alternative SR initiatives (Saaty, 2008).
6. Supporting decisions related to MI using contextual checklists built in different modules using a third-party fourth-generation language to write programs for specialized requirements, including algorithms for MI support.

7. Supporting decisions related to SI using mainly the service management, lean manufacturing, quality management, and wholesale and distribution modules.
8. Supporting decisions related to CE using contextual checklists built in different modules using a third-party fourth-generation language to write programs for specialized requirements, including algorithms for insuring conformance to CE.

Reviewing the decision-supporting functionality of Infor ERP shows high potential for achieving a balanced fit with both business and ethics requirement attributes in strategic decision making.

Decision-Supporting Functionality of Sage Enterprise Resource Planning

The Sage Group is one of the key players in providing business management software and services such as Peachtree Accounting, Sage CRM, Sales Logix, and ACT (MarketWatch, 2019). The Sage ERP system includes several modules. Sage ERP accounting and financial management module integrates all sales and service functions delivering end-to-end financial management. Sage ERP BI and reporting module empowers decision makers to obtain the information they need for operations and strategic planning. It provides key performance indicators (KPIs) to effectively allocate resources, increase customer uptime, and enhance productivity across all business systems. Sage ERP human resources module ensures higher employee retention and manages employee development and growth. It helps manage the global workforce from recruitment to retirement. Sage ERP CRM module allows officials and decision makers to keep track of all customers and leads data and to optimize their marketing and sales efforts. Sage ERP e-Business and web-store module offers customers a modern digital shopping experience with TCP/IP solutions. Sage ERP electronic data interchange (EDI) module offers the computer-to-computer exchange between business partners of business documents in a standard electronic format. Sage ERP purchase order module maximizes purchasing power by implementing automated best practices and reduces costs by consolidating inventory and distribution processes and improving cycle times. Sage ERP inventory advisor module helps reduce stock-outs, excess inventory, and working capital. It connects to other Sage ERP data to deliver inventory checks, produce quality forecasts, and solve for the optimal investment required to achieve target fill rates. Sage ERP inventory control and warehouse management module ensures a business follows best practices for efficiency and accuracy by automating and integrating processes to keep the warehouse, inventory, production, and service departments aligned. Sage ERP sales analysis and sales optimizer module produces accurate estimates, streamlines the order-to-cash cycle, and optimizes sales capacity. Sage ERP time and project management module ensures optimal performance of the project management processes at any point. It helps make smart service and support decisions that meet customer expectations. Sage ERP project and job costing module delivers efficient management of estimating, tracking, costing, and billing of projects, and simplifies cost control and planning processes.

According to the vendor’s catalog, the decision-supporting functionality of Sage ERP includes the following:

1. Supporting decisions related to financial aspects using all functional Sage ERP modules, integrated to the accounting and financial management module.
2. Supporting decisions related to customer aspects using all functional Sage ERP modules, integrated to the CRM module.
3. Supporting decisions related to business processes using mainly the BI, eBusiness and webstore, EDI, inventory control and warehouse management, time and project management, and project and job costing modules.

4. Supporting decisions related to organizational learning and innovativeness using mainly the Sage ERP human resources and BI modules.
5. Supporting decisions related to SR using the accounting and financial management, BI, sales analysis and sales optimizer, time and project management, and project and job costing modules, along with some multi-criteria decision making modules from a third party, such as Expert Choice (Saaty, 2008), for selecting among alternatives of SR initiatives.
6. Supporting decisions related to MI using contextual checklists built in different modules using a fourth-generation language to write programs for MI support algorithms.
7. Supporting decisions related to SI using the BI, CRM, EDI, and purchase order modules.
8. Supporting decisions related to CE using the BI, CRM, EDI, purchase order, inventory control and warehouse management, sales analysis and sales optimizer modules along with the incorporation of contextual checklists in different modules using a third-party programing language for insuring conformance to CE.

Reviewing the decision-supporting functionality of Sage ERP shows high potential for achieving a balanced fit with both business and ethics requirement attributes in strategic decision making.

Figure 7 summarizes the decision-supporting functionality of ERP products mentioned in the preceding paragraphs. The figure shows the main links from the ERP modules of each product to each category of business and ethical attributes of DSS.

As indicated in Figure 7, the capabilities of the ERP-based DSS of the six commercial products match the four business requirement attributes of DSS: FA, CA, BP, and LI. They also match the four ethical requirement attributes of DSS: SR, MI, SI, and CE. Each one of these attributes can be supported with one or more ERP modules in each product of the six vendors considered in this study. In addition to the main direct links shown in Figure 7, there are several other indirect links with all ERP modules used according to each decision-making case. One may conclude from Figure 7 that the decision-supporting functionalities of ERP-based DSS could be used in defining the constructs of the research model and hypotheses development, as addressed in the next section.

Categories	Decision Support Attributes	Main Links / Modules	SAP	Oracle	Microsoft	Epicor	Infor	Sage
Categories of Business Attributes	Finance	Financial Accounting & Controlling	+	+	+	+	+	+
		Financial Supply Chain Management	+	+	+	+		
		Project & Job Costing		+				+
		Business Planning & Consolidation	+	+		+		
		Corporate Performance Monitor	+					
		Sales and Distribution Management	+		+	+	+	+
		Sales Analysis & Sales Optimizer	+		+	+	+	+
	Costumers	Customer Relationship Management	+	+	+	+		+
		e-Business & Web-store				+		+
		Marketing			+			
	Business Process	Product Management				+		
		Production Planning & Management	+		+	+		
		Material Management & Purchase Order	+					+
		Inventory Management & Warehouse		+				+
		Inventory Advisor						+
		Manufacturing & Lean Manufacturing		+			+	
		Project-based Manufacturing					+	
		Time & Project Management						
		Plant Maintenance	+		+	+		+
		Service & Asset Management	+					
		Quality Management				+	+	
		Supply-Chain Management	+				+	
		Electronic Data Interchange (EDI)		+		+		
	Learning & Innovativeness	Human Resource Management	+	+		+	+	+
		Advanced Planning & Optimization	+					
		Strategic Enterprise Management	+					
Categories of Ethical attributes	Social Responsibility	Advanced Business Application Programming	+					
		Business Data Warehouse	+	+	+			
		Compliance Management for Service-Oriented Architecture	+					
	Moral Intensity	Application Programming Interface (API)	+	+	+	+	+	+
		Interface with 3rd party DSS Modules	+	+	+	+	+	+
	Stakeholders Involvement	Stakeholder Relationship Management				+		
		Enterprise Content Management	+			+		
		Information Systems Management	+			+		
		Business Information Collection	+					
	Codes of Ethics	Business Intelligence, Analytics & Reporting		+	+	+		+
		Enterprise Risk Management	+			+		
		Government, Risk & Compliance	+			+		

Figure 7. Decision-supporting functionality of enterprise resource planning products

Research Model and Hypotheses Development

Cane and McCarthy (2009) identified three concepts of fit used in TTF research. The first is fit as moderation of the interactive effects of certain task and technology characteristics (Cane & McCarthy, 2009). The second is fit as matching, in which fit is studied by comparing many technologies across a single task or vice versa (Cane & McCarthy, 2009). The third is fit as a profile deviation from the ideal profile (Cane & McCarthy, 2009). The problem of balanced fit with two different tasks in two different directions has not been identified. A proposed model of task-technology balanced fit (TTBF) is depicted in Figure 8.

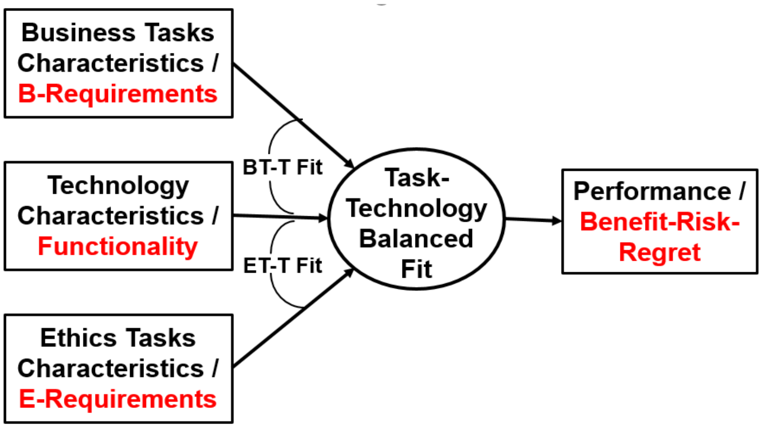

Figure 8. Proposed model of task-technology balanced fit
(BT-T Fit = Business Tasks Technology Fit; ET-T Fit = Ethics Tasks Technology Fit).

As illustrated in Figure 8, the task characteristics were represented in the proposed research model by the requirements for using an ERP-based DSS. The business requirement attributes were measured based upon the four perspectives of the BSC. The ethical requirement attributes were measured based upon common ethical attributes used in the literature. The technology characteristic fit with each requirement attribute was measured with three questions. The ratio of ethics-tasks-technology fit to the business-tasks-technology fit represents the TTBF. System performance and utilization were measured together with four questions about decision benefits, reducing risk, avoiding regret, and user satisfaction.

Based upon the proposed model of TTBF, the research formative model consisted of one dependent variable, which was the perceived system performance (*PSP*), three independent variables, one moderating variable, and four control variables. The three independent variables were: system fit to business requirements (*BRF*), system fit to ethics requirements (*ERF*), and balanced fit to both ethics and business requirements (*EBB*). The moderating variable was the perceived organizational ethics (*POE*). The four control variables were the company's age (*AGE*), company's size (*SIZ*), type of industry (*IND*), and ERP vendor (*VEN*).

As depicted in Figure 9, the first independent variable (*BRF*) included the fit of four business requirement attributes: FA, CA, BP, and LI. The second independent variable (*ERF*) included the fit of four ethical requirement attributes: SR, MI, SI, and CE.

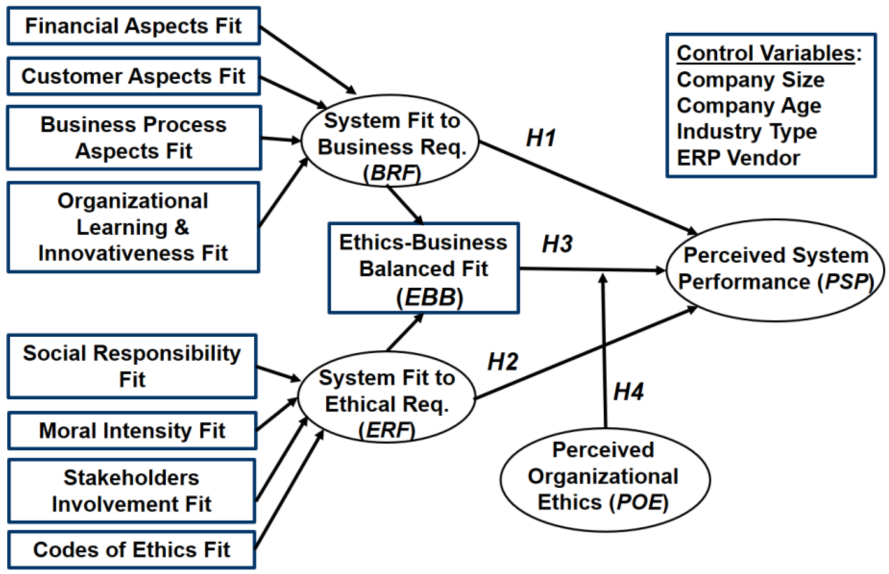

Figure 9. The research model (Req. = Requirements).

The third independent variable (*EBB*) reflects a level of balanced fit with both ethical and business attributes in DSS design. The perceived organizational ethics (*POE*) was considered a moderating variable that influences the relationship between ethics-business balanced fit and perceived system performance.

The four hypotheses indicated in the research model (Figure 9) are addressed in the following four paragraphs.

The Relationship between Business Requirement Attributes Fit and Perceived System Performance

Ackoff (1999) said, “Profit is like oxygen. If you do not have enough, you will not be around long; but if you think life is breathing, you are missing something” (p. 18). Customer satisfaction is seen as an important attribute in influencing repurchase intention, which leads to improvement in organizations’ growth and earnings (Straker, Wrigley, & Rosemann, 2015). Fink, Yogev, and Even (2017) indicated that “operational value represents improvements in the efficiency of business processes, including cost reduction and productivity enhancement” (p. 7). Also, the learning and growth attribute focuses on the creation of business value through innovative practices (Butler, Henderson, & Raiborn, 2011). Finance, customers, business process, and learning and growth are the four perspectives of BSC in strategic decision making (Kaplan & Norton, 1996). Several types of research have recommended the use of the BSC for measuring business attributes of organizational strategies (Al-Hosaini & Sofian, 2015; Gupta & Salter, 2018; Mehralian et al., 2018).

Wang, Mora and Raisinghani (2015) described the design and proof of concept of a DSS based upon BSC modeling and analysis. Most scholars in the field consider the main role of DSS is to satisfy the requirements of business decisions (Bass, 1983; Cornell, 1980; Harrison, 1996; Lin et al., 2014; Maas et al., 2014; Shirley, 1982). Consequently, the fit of DSS characteristics with the requirements of business decisions is considered a reason for improving system performance. So, a better fit of business requirement attributes in DSS design is expected to have a positive relationship with perceived system performance. The study hypothesized the following:

> H_1: The level of DSS fit with business requirement attributes has a positive relationship with perceived system performance.

The Relationship between Ethics Requirement Attributes Fit and Perceived System Performance

The economics philosopher Handy (1995) asked, “What is a business for?” (p. 159). Handy (1995) suggested that the purpose of any organization is not only to make profits; rather, making a profit is a way of raising capabilities to do ultimate things. As Handy (1995) stated, “Profit is a means to other ends rather than an end in itself … A requirement is not a purpose” (p. 159). Intezari and Pauleen (2013) stated,

> The mutual effects of business and society on one another, the interwoven natures of economic and social growth and development, and the increasing importance of bio-environmental issues all require business people to ultimately shift their decisions from being made based solely on the trade-off between ethics and benefits, and rather on the extensive interdependence of financial success and social credibility, p. 187.

A growing number of researchers have recommended that organizations should consider the larger picture of the business environment and focus on a long-term view of consequences when making decisions that involve ethical issues (Branco & Rodrigues, 2007; Chelliah et al., 2017). Many researchers and practitioners have viewed ethical issues as a key source of an organization's long-term performance (Chatterji & Richman, 2008). Several of them have claimed that ethical behavior is the heart and soul of business and that long-term profits and ethics are naturally related (Murillo & Martinek, 2009; Primeaux & Stieber, 1994). Some researchers have shown that the ethical dimension in a DSS should receive more attention in system design (Courtney, 2001; Richardson, Courtney, & Paradice, 2001).

One of the main reported reasons why ethical scandals occur is that companies did not pay enough attention to ethical attributes in their DSSs (Bachmann et al., 2017; Bounie et al., 2018; Carson, 2003; Robison, 2018; Smith, 2016; Trevino & Nelson, 2016; Tuttle, 2018). The ethical factors in these cases were either superseded or ignored when the focus was only on business factors (Common, 2018). Enhancing the ethical attributes in DSS is an effective approach for improving the system performance capability to protect against such scandals (Hummel et al., 2018). Better fit of ethical attributes in DSS design should improve perceived system performance. The study hypothesized the following:

H_2: The level of DSS fit with ethical requirement attributes has a positive relationship with perceived system performance.

The Relationship between Ethics-Business Balanced Fit and Perceived System Performance

Malakooti (2012) believed that "understanding the decision process can provide insights into how humans make decisions…decision makers who are conscious of their decision process types can make more effective and balanced decisions" (p. 733). Verschoor (1998) studied the link between overall financial performance and a commitment to ethics in the 500 largest U.S. public corporations. Verschoor's (1998) study showed that there is a significant causal relationship between a management commitment to ethical and socially responsible behavior and corporate financial performance. Mitroff and Denton (1999) argued that when organizations do not give enough attention to spirituality (ethics), they face more problems. Their empirical study of ethics in the workplace showed that organizations that are more ethical are also more profitable, and the managers of these organizations can apply more of their creativity and intelligence in the workplace (Mitroff & Denton, 1999). They believe that profits are directly related to ethical decision making (Mitroff & Denton, 1999).

The theory of TTF can examine the balanced fit of DSS with both business and ethics requirement attributes. Zack (2007) posited that TTF is an accepted approach to evaluating the IT application's performance, and De-Haes and Van-Grembergen (2009) considered the users' evaluation of fit to be a relevant measure for DSS success. Achieving a balanced fit with both business and ethics requirement attributes should have a positive impact on perceived system performance. The study hypothesized the following:

> H_3: The balanced fit of DSS with both business and ethical requirement attributes has a positive relationship with perceived system performance.

The Moderating Influence of Perceived Organizational Ethics

The International Business Ethics Institute defined organizational ethics as a form of applied ethics in which the latter's purpose is to develop a sense within a company's employee population of how to conduct business responsibly (Miller, 2008, p. 11). Several authors have considered organizations as social actors responsible for the ethical or unethical decisions of their employees (Simha & Cullen, 2012; Simha & Stachowicz-Stanusch, 2013; Victor & Cullen, 1988). As Hunt and Vitell (1986) explained, the ethical decision-making process begins with the organizational environment where the ethical dilemmas arise. Organizational ethics is a system of shared norms and values that exist and are practiced throughout the organization (Schein, 2004). Organizational ethics may include formal CEs, such as professional ethical codes and policies, as well as non-codified expectations of behaviors that may influence ethical decision making, such as obedience to authority (Trevino, Brown, & Hartman, 2003). Also, organizational reward systems may motivate some unethical decisions by managers who are under pressure to meet organizational financial goals (Carson, 2003).

Spicer, Dunfee, and Bailey (2004) showed that "the type of norm present in a situation clearly moderated the effect of national context on ethical decision making" (p. 18). From this perspective, the perceived organizational ethics may moderate the relationship between the level of ethics-business balanced fit in DSS design and perceived system performance. The study hypothesizes the following:

H_4: Perceived organizational ethics has a positive moderating effect on the relationship between the ethics-business balanced fit and perceived system performance.

Methods

The main objective of this study was to investigate the impact of achieving a balanced fit of DSS with both business and ethical requirement attributes on perceived system performance at the enterprise level. The method that can support such an objective is quantitative research (Anderson, Wennberg, & McMullen, 2019), specifically quantitative research that measures the IT practitioner's perception of ERP-based DSS performance at several levels of balanced fit between ethical and business attributes of the system. The survey was preferred over the case study for this research to reach a greater variety of technologies (ERP brands) and tasks (levels of business and ethical attributes). A survey method allowed the development of a representative picture of the attitudes and characteristics of a broader population of firms that model their strategic direction and position within their ERP system.

ERP-based DSS practitioners are the most appropriate respondents to inform on the implementation knowledge and details of the ERP-based DSS in their companies. They should have enough insights about the relative importance of both business and ethical factors in their ERP and are uniquely qualified to answer the survey questions.

Sampling Design

The target population of the research was the ERP-based DSS practitioners in private commercial companies in the United States. The United States has one of the highest rates of ERP adoption in the world, and this population should reveal insights that may be generalized to other countries. Within such a population, a representative sample can be selected randomly.

According to Mahbub (2015), the required sample size depends on two key main factors: the degree of required accuracy and the level of variation in the population with regards to the key factors of the study. However, Aldwsry (2012) showed that the nature of the research project being investigated and its target population as well as other intractable issues, such as the available time and financial resources, are important factors in determining a sample size. Several approaches have been followed in literature to determine a sample size, including those described in the following paragraphs.

Rule of thumb. Some scholars have given the general rule of thumb of the ratio between the sample size and the total number of research variables as 10:1 (Bentler and Chou, 1987). So, we may consider the sample size for the current research as 10 X 11 variables = 110 subjects.

Saunders' formula. The minimum sample size should be determined, according to Saunders, Lewis, and Thornhill (2007), using a statistical formula with three measures: the degree of confidence, the accepted margin of errors, and the proportion of responses relating to particular attributes. To calculate the minimum sample size, the following formula was used:

$$n = p\% \text{ X } q\% \text{ X } (z / e\%)^2 \quad (1)$$

where n is the minimum sample size, p% is the proportion of belonging to the specified category, q% is the proportion of not belonging to the specified category, z corresponds to the required confidence level, and e% corresponds to the margin of accepted error.

In the current study, p% refers to the proportion of ERP-based DSS with a balanced fit to both business and ethical attributes, and q% is its complement. Assuming that p% is almost 10% and considering a 95% confidence level (z = 1.96) and 5% margin of error that are widely used and accepted in the research community (Saunders et al., 2007), the sample size for the current study could be about 140 based on Equation 1, $n = 0.1 \text{ X } 0.9 \text{ X } (1.95 / 0.05)^2$.

Cochran's formula. A second statistical approach is applied in Cochran's (1977) sample size formula. Assuming that the alpha level is set a priori at .05 (t = 1.96), using a 7-point Likert scale, setting the level of acceptable error at 3%, and using an estimated standard deviation of the scale as 1.167 (s), the Cochran's sample size formula is:

$$n = (t)^2 * (s)^2 / (d)^2 \quad (2)$$

where n is the minimum sample size, t is the value for the selected alpha level of .025 in each tail equaling 1.96, s is the estimate of standard deviation in the population equaling 1.167 (estimate of variance deviation for 7-point scale was calculated by using the range of scale 7 divided by 6, which is the number of standard deviations that include almost all possible values in the range), d is the acceptable margin of error for mean being estimated equaling 0.21 (calculated as the number of points on primary scale [7] X acceptable margin of error [0.03].

$$n = (t)^2 \text{ X } (s)^2 / (d)^2 = (1.96)^2 \text{ X } (1.167)^2 / (7 \text{ X } 0.03)^2 = 119 \quad (3)$$

Cohen and Cohen formula. Another statistical approach widely followed in literature is the use of Cohen and Cohen's (1975, p. 118) formula:

$$n = (L / \text{effect size}) + k + 1 \quad (4)$$

where n is the minimum sample size, k is the number of independent variables, L equals 23.59 (from Table E.2 of Cohen & Cohen, 1975, p. 447 at k = 9 and power = 0.95), and effect size is a measure of the strength of the relationship between two variables. For regression analysis, Cohen (1988) defined values near 0.02 as small, near 0.15 as medium, and above 0.35 as large. The effect size for this study was considered to be 0.15 at a medium level.

$$n = (23.59 / 0.15) + 9 + 1 = 167 \quad (5)$$

G*Power estimate. G*Power is a tool to compute statistical power analyses for many different *t* tests, *F* tests, X^2 tests, *z* tests, and some exact tests (Faul, Erdfelder, Buchner, & Lang, 2009). The G*Power tool can also be used for computing effect sizes and for displaying graphically the results of power analyses. As illustrated in Figure 10, the parameters used in the G*Power calculator to determine a sample size are: effect size $f^2 = 0.15$, as a medium level of effect size (Cohen, 1988); $\alpha = 0.05$; power $(1 - \beta) = 0.95$; number of predictors = 9. The result is a sample size of 166.

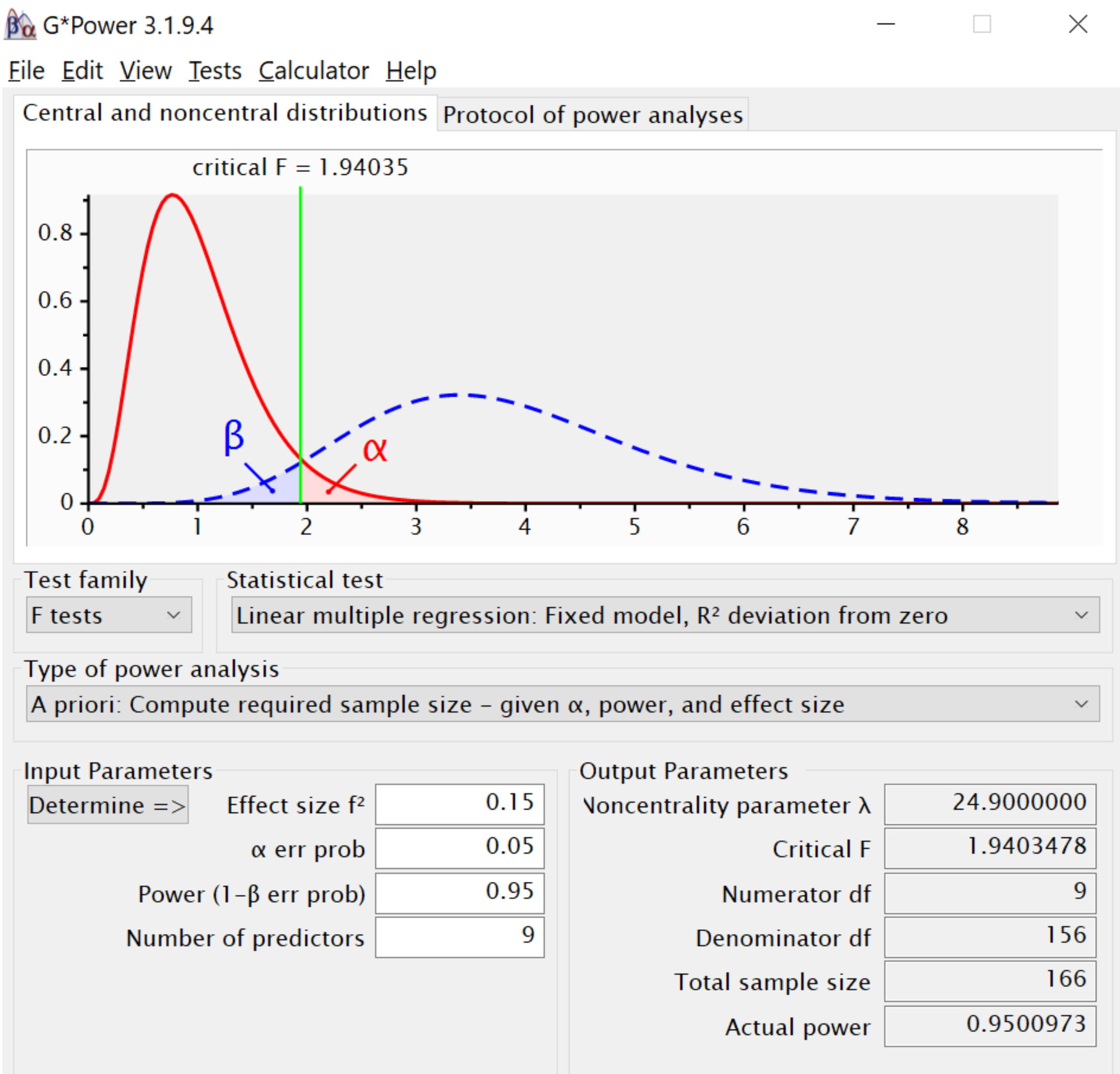

Figure 10. Print screen of G*Power calculator
(Faul, Erdfelder, Buchner, & Lang, 2009, p. 1151).

In conclusion, based on the different approaches, the choices of sample size were between 110 subjects following the general rule of thumb, 140 using Saunders' formula, 119 using Cochran's formula, 167 using Cohen & Cohen's formula, or 166 using the G*Power calculator. A sample size of 170 was used in the current study for running the multiple regression models.

Research Design and Methods of Data Collection

A third-party online survey company, Qualtrics, was used for developing and administering the survey instrument. The TurkPrime facility of Amazon was used for recruiting survey participants. The company has an international database of pre-qualified potential respondents, including those who work directly with ERP. Given the relative difficulty and challenges present in data collection, the Qualtrics and TurkPrime platforms have the advantages of convenience, quality data, and safeguards. Waggoner (2018) suggested that the use of Qualtrics along with TurkPrime Panels presents an efficient way of gathering somewhat difficult-to-obtain participants.

A sample of 170 fulltime U.S.-based IT practitioners who are involved in ERP-based DSS was used to collect data for running the multiple regression model and testing the research hypotheses. The sample was randomly selected from various industries in the United States. The online survey administration company Qualtrics displayed the survey on their site. Qualtrics provides a proven online survey tool that fulfills the current research needs, and it is available for use by UW-Whitewater's faculty and students.

Conceptual and Operational Definition of Variables

Dependent variable. According to goal-setting theory (Hollenbeck & Klein, 1987), two attributes of goal commitment were identified: attractiveness of goal attainment and expectancy of goal attainment. Todd and Benbasat (1999), in their cost-benefit theory in DSS, considered goal attractiveness as the benefit of using DSS. The utmost benefit of using DSS is to support the accomplishment of company strategies and goals (Dulcic, Pavlic, & Silic, 2012). The expectancy of goal attainment could be measured as the probability of avoiding undesired consequences in strategic decision making (McGrath, 2004). Hung, Ku, Liang, and Lee (2006) also proved that regret avoidance is an important measure of DSS success. Regret is defined as "a post-decision feeling regarding not having chosen a better alternative" (Hung et al., 2006, p. 2093). Applying these concepts to the evaluation of ERP-based DSS, the dimension of goal attractiveness is represented as the convenience of accomplishing a company's strategies and goals. The dimension of expectancy of attainment is represented as the extent of reducing undesired consequences and avoiding regret.

The perceived system performance (*PSP*), as a dependent variable, was measured using three items for self-reported evaluation of IT practitioners in private commercial companies in the United States. The first item was adapted from Dulcic et al. (2012, p. 1570), the second was adapted from McGrath (2004, p. 249), and the third item was adapted from Hung et al. (2007, p. 2101). The survey items are listed in Table 3 and in Appendix A.

Independent variables. The three independent variables of the research model were system fit to business requirements (*BRF*), system fit to ethical requirements (*BRF*), and ethics-business balanced fit (*EBB*).

System fit to business requirements. The first independent variable of system fit to business requirements (*BRF*) was based on the four business attributes fit in DSS design: FA, CA, BP, and LI. Each variable was measured in three items using direct questions for self-reported evaluation of IT practitioners in private commercial companies in the United States. The three items of FA, the three items of CA, and the three items of BP were adapted from Prasad and Green (2015, p. 16). The three items of LI were adapted from García-Morales et al. (2006, p. 41), Kale et al. (2000, p. 237), and Verdú et al. (2012, p. 588).

BRF is the second order construct that was derived by the four mentioned sub-constructs. It was calculated in the formative model as the average value of the four corresponding first order constructs. The survey items are listed in Table 3 and in Appendix A.

System fit to ethical requirements. The second independent variable of system fit to ethical requirements (*ERF*) was based on the four ethical attributes fit in DSS design: SR, MI, SI, and CE. Each variable was measured in three items using direct questions for self-reported evaluation of IT practitioners in private commercial companies in the United States. The three items of SR were adapted from Kim and Ferguson (2014, p. 6); the three items of MI were adapted from McMahon (2002, p. 120); the three items of SI were adapted from Atuheire (2018, p. 60); and the three items of CE were adapted from Svensson et al. (2009, p. 261).

ERF is a second order construct that was derived by the four mentioned constructs. It was calculated in the formative model as the average value of the four corresponding first order constructs. The survey items are listed in Table 3 and in Appendix A.

Ethics-business balanced fit. The third independent variable is the ethics-business balanced fit (*EBB*), which reflects the level of balance between the business and ethical attributes fit in the design of DSS. The variable was measured as the ratio between the level of fit of ethical attributes and the level of fit of business attributes in DSS design. The level of fit of ethical attributes was calculated as the average of average values of the three measuring items of each ethical attribute fit. Also, the level of fit of business attributes was calculated as the average of average values of the three measuring items of each business attribute fit. So, the ethics-business balanced fit may be calculated as the ratio between the two averages of ethical and business attributes fit. The result is a single value on a ratio scale. However, this approach of modeling *EBB* tends to have a multicollinearity problem. The mean-centering the variables method may be used to reduce the impact of multicollinearity on the results (Shieh, 2011).

A second approach to assessing the ethics-business balanced fit is the use of three direct questions of the Likert 7-point scale to ask the respondent to compare the level of fit of the system to both business and ethical decisions. The survey items are listed in Table 3 and in Appendix A.

Moderating variable. The four ethical requirement attributes for making strategic decisions as independent variables interact mainly with the external environment, while the perceived organizational ethics variable is related to an organization's internal environment. The perceived organizational ethics variable (*POE*) is considered as a moderating variable that influences the relationship between the ethics-business balanced fit (*EBB*) and the perceived system performance (*PSP*).

The perceived organizational ethics was measured by five questions with the 7-item Likert scale given by Hunt, Wood, and Chonko (1989). The survey items are listed in Table 3 and in Appendix A. The original Cronbach alpha index of the scale is 0.78 (Hunt et al., 1989).

Control variables. The control variables that have been recommended in similar studies are company size, age, ERP vendor, and industry type. The size (*SIZ*) is represented by the total number of employees in a company, as given by García-Morales et al. (2006, p. 42). The age

(*AGE*) is represented by the number of years the company has been in business, as given by Afrifa (2015, p. 28). The ERP vendor (*VEN*) is represented by the name of vendor, as given by Oldacre (2016, p. 160). The industry (*IND*) is represented by the type of industry in which the company operates, as also given by Afrifa (2015, p. 28).

The conceptual and operational definition of all variables of the research model are summarized in Table 3.

Table 3

List of Survey Items and Their Original Sources

Variable	Code	Item	Adapted from
		Part 1: Background	
ERP-User	*ERP*	Do you work with Enterprise Resource Planning Systems (ERP)?	Alghamdi (2018, p. 141)
ERP-based DSS-User	*DSS*	Do you work with ERP for executing strategic decisions (i.e., entering new markets, using new technology, starting a new product line, etc.)?	
ERP Vendor	*VEN*	What type of ERP system is in use at your company?	Oldacre (2016, p. 160)
Size	*SIZ*	How many employees are there in your company (approximately)?	Mu (2007, p. 135)
Industry	*IND*	Which industry does your company operate in?	Afrifa (2015, p. 28)
Age	*AGE*	What is the age of your company in years?	Afrifa (2015, p. 28)
		Part 2: System Fit to Business Requirements (*BRF*)	
Fit to Financial Aspects (FA)	*FA1*	The ERP system supports decisions that improve my company's return on investment (ROI).	Prasad & Green (2015, p. 16)
	FA2	The ERP system supports decisions that improve my company's return on equity (ROE).	Prasad & Green (2015, p. 16)
	FA3	The ERP system supports decisions that improve my company's return on assets (ROA).	Prasad & Green (2015, p. 16)
Fit to Customers Aspects (CA)	*CA1*	The ERP system supports decisions that improve our customer's perception of products quality.	Prasad & Green (2015, p. 16)
	CA2	The ERP system supports decisions that improve our customers' perception of services quality.	Prasad & Green (2015, p. 16)
	CA3	The ERP system supports decisions that improve our customer's satisfaction in general.	Prasad & Green (2015, p. 16)

(continued)

(continued)

Variable	Code	Item	Adapted from
Fit to Business Processes (BP)	*BP1*	The ERP system supports decisions that improve my company's productivity.	Prasad & Green (2015, p. 16)
	BP2	The ERP system supports decisions that improve my company’s production cycle time.	Prasad & Green (2015, p. 16)
	BP3	The ERP system supports decisions that improve my company’s responsiveness of customer service.	Prasad & Green (2015, p. 16)
Fit to Learning & Innovativeness (LI)	*LI1*	The ERP system supports decisions that enhance my company's existing capabilities and skills.	Kale, Singh, and Perlmutter (2000, p. 237)
	LI2	The ERP system supports decisions that improve the rate my company introduces new products or services.	García-Morales, Lloréns-Montes, & Verdú-Jover (2006, p. 41)
	LI3	The ERP system supports decisions that improve the rate my company introduces new methods of production or services.	Garcia-Morales et al, (2006, p. 41)
		Part 3: System Fit to Ethics Requirements (*ERF*)	
Fit to Social Responsibility (SR)	*SR1*	The ERP system helps identify social service opportunities for my company (e.g., Corporate Social Responsibility).	Kim & Ferguson (2014, p. 6)
	SR2	The ERP system helps evaluate goals for my company to achieve by participating in social services (e.g., Corporate Social Responsibility).	Kim & Ferguson (2014, p. 6)
	SR3	The ERP system helps determine how long my company should support each social service activity.	Kim & Ferguson (2014, p. 6)
Fit to Moral Intensity (MI)	*MI1*	The ERP system helps determine the negative side effects (if any) of a decision and the probability and concentration of the effect.	McMahon (2002, p. 120)
	MI2	The ERP system helps determine the level of social agreement for each decision.	McMahon (2002, p. 120)
	MI3	The ERP system helps identify the duration that a decision’s negative outcome may appear.	McMahon (2002, p. 120)

(continued)

(continued)

Variable	Code	Item	Adapted from
Fit to Stakeholders Involvement (SI)	*SI1*	The ERP system helps stimulate stakeholder involvement in each decision-making process.	Atuheire (2018, p. 60)
	SI2	The ERP system helps enable stakeholders to work together as win-win partners.	Atuheire (2018, p. 60)
	SI3	The ERP system helps promote mutual trust amongst different stakeholders.	Atuheire (2018, p. 60)
Fit to Codes of Ethics (CE)	*CE1*	The ERP system helps verify that professional Codes of Ethics are complied with/followed by all stakeholders.	Svensson, Wood, Singh, and Callaghan (2009, p. 261)
	CE2	The ERP system helps identify the consequences for a violation of professional Codes of Ethics.	Svensson et al. (2009, p. 261)
	CE3	The ERP system helps ensure that professional Codes of Ethics guide my company's strategic planning.	Svensson et al. (2009, p. 261)
Part 4: Understanding the balance between decisions related to business and related to ethics			
Ethics-Business Balanced Fit (EBB)	*EBB1*	The ERP system helps make decisions related to ethics as much as it helps make decisions related to business.	
	EBB2	The ERP system reviews each decision related to business ethically.	
	EBB3	The ERP system reviews each decision related to ethics according to business concern.	
Part 5: ERP performance			
Perceived system performance (PSP).	*PSP1*	Overall, the use of an ERP system makes it more convenient to accomplish my company's strategies and goals.	Dulcic, Pavlic, and Silic (2012, p. 1570)
	PSP2	Overall, the use of an ERP system reduces the probability of undesired consequences in strategic decision making.	McGrath (2004, p. 249)
	PSP3	Overall, the use of an ERP system reduces the later regret of not taking a different decision.	Hung, Ku, Liang, and Lee (2007, p. 2101

(continued)

(continued)

Variable	Code	Item	Adapted from
		Part 6: Company's ethical environment	
Perceived Organizational Ethics (POE)	*POE1*	Managers in my company often engage in behaviors that I consider to be unethical.	Hunt, Wood, and Chonko (1989, p. 84)
	POE2	In order to succeed in my company, it is often necessary to compromise one's ethics.	Hunt et al. (1989, p. 84).
	POE3	Top management in my company has let it be known in no uncertain terms that unethical behaviors will not be tolerated.	Hunt et al. (1989, p. 84).
	POE4	If a manager in my company is discovered to have engaged in unethical behavior that results primarily in personal gain (rather than corporate gain), he or she will be promptly reprimanded.	Hunt et al. (1989, p. 84).
	POE5	If a manager in my company is discovered to have engaged in unethical behavior that results primarily in corporate gain (rather than personal gain), he or she will be promptly reprimanded.	Hunt et al. (1989, p. 84).

Ensuring measures validity and reliability. The face validity or logical validity refers to the appearance of the survey instrument regarding the clarity of the language, consistency of style, and formatting (DeVon et al., 2007). Content validity is closely related to face validity. While face validity relates to the clarity of the measure, the content validity relates to whether the measure is assessing all domains of a construct (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). Both face validity and content validity are first evaluated by reviewing the measurements with three academics and five industry experts using a Q-sort test of congruence. Based on their evaluation, a pilot test is conducted with fellow researchers and practitioners who are experts in the field. A large percentage of their agreement on the measurement scales is evidence of face validity and content validity. Pilot testing encompasses all the procedures involved in data collection before the actual data collection begins. The first and second items of the fifth section report in detail the results of the Q-sort test and pilot test conducted in the current study.

Dealing with common-method bias. When using a survey to explore the perceptions of IT practitioners on both dependent and independent variables, a problem of common-method bias (CMB) may arise. This is a situation in which systematic variance is shared among the variables measured; the variation is introduced by the measurement method rather than the constructs or questions being asked. Respondents who have a tendency to provide a similar answer to survey questions that are not related can create false correlations (Jakobsen & Jensen, 2015). A respondent who typically rates high on scales in general might rate higher on the scales of both independent and dependent variables. In contrast, a respondent who typically rates lower on scales in general might rate lower on the scales of both independent and dependent variables. Thus, a potential CMB could be involved in the project due to the response style of the respondents. This can potentially lead to errors in the results produced.

Podsakoff, MacKenzie, Lee, and Podsakoff (2003) argued that using data from one source for both independent and dependent variables does not automatically lead to a bias and recommended a range of ways for dealing with CMB. These ways could be split into either a procedural remedies approach in the phase of measurement or a statistical remedies approach in the phase of analysis. In the procedural remedies approach, several remedies were considered in the current research (Podsakoff et al., 2003):

1. To reduce the potential for respondents reverting to answering questions in a systematic way, which was implemented in the current research survey by creating separation between independent and dependent variables;
2. To eliminate common scale properties, which was implemented in the current research survey by using inverse scoring in some items;
3. To remove ambiguity, which was implemented in the current research survey by testing both face validity and content validity with three academics and five industry experts in a Q-sorting test, and based on their evaluation, conducting a pilot test with 14 practitioners before running the full survey, as depicted in the previous paragraph.
4. To remove potential social desirability in the questions asked, which was implemented in the current research survey by testing both face validity and content validity; and
5. To obtain measures for the independent and dependent variables from different sources, which could not be conducted in this research since it adds difficulty to the data collection process with the level of targeted respondents and the anonymous mode of collecting data.

In the statistical remedies approach, the Harman's one-factor test is the most recommended option by Gholami, Molla, Goswami, and Brewster (2018). The test was conducted on the collected data using SPSS-24. The summary of results is listed in Table 4.

Table 4

Results of Harman's One-Factor Test

	Initial Eigenvalues			Extraction Sums of Squared Loadings[a]		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	17.978	49.938	49.938	17.517	48.657	48.657
2	2.600	7.223	57.160			
3	1.850	5.138	62.298			
4	1.420	3.944	66.242			
5	1.007	2.798	69.040			
6	.856	2.378	71.418			
7	.807	2.243	73.661			
8	.731	2.032	75.693			
9	.712	1.978	77.671			
10	.623	1.731	79.402			
11	.609	1.692	81.093			
12	.582	1.616	82.709			
13	.519	1.442	84.151			
14	.485	1.347	85.498			
15	.415	1.154	86.652			
16	.404	1.121	87.773			
17	.376	1.043	88.816			
18	.358	.995	89.811			
19	.334	.927	90.738			
20	.309	.859	91.596			
21	.301	.837	92.433			
22	.288	.801	93.234			
23	.272	.755	93.989			
24	.257	.714	94.704			
25	.219	.608	95.312			
26	.215	.597	95.908			
27	.212	.589	96.498			
28	.197	.546	97.044			
29	.177	.493	97.537			
30	.154	.427	97.963			
31	.153	.426	98.390			
32	.133	.368	98.758			
33	.125	.346	99.104			
34	.117	.325	99.429			
35	.113	.313	99.741			
36	.093	.259	100.000			

[a]Extraction Method: Principal Axis Factoring

The results indicated a high level of variance accounted by a single factor (48.7%) but less than the 50% limit advised by Gholami et al. (2018). Further, as reported in Appendices B and C, adequate construct validity was demonstrated, which is considered by Conway and Lance (2010) "one way to rule out substantial method effects" (p. 329). All of these indicate that even if CMB cannot be completely ruled out, it does not represent a significant bias in the data set.

Procedures

After the approval of the university institutional review board (IRB), three academics and five industry experts reviewed the survey items using a Q-sort test, and a pilot test was conducted with 14 participants, as depicted in the following two paragraphs. All participants in the pilot study and the final survey provided their informed consent before participating in the study. The data were collected under true anonymity and analyzed at the aggregate level only.

A survey of 42 items was conducted with a random sample of ERP practitioners who are experts in using ERP-based DSS. The survey asked respondents about the relative levels of fit of business and ethical attributes considered in a DSS and the corresponding perceived system performance.

Q-sorting test on survey items. Giving a theoretical definition of the five constructs in the research model, formal development of a measurable scale was conducted using the Q-sorting method. The goal of this task was to ensure that the meaning associated by the researcher with each item was the same as that associated with it by the respondents. The Q-sort technique as defined by Moore and Benbasat (1991) asks experts to sort items according to their association to the constructs' definitions. This procedure is specially recommended when new scales are being developed (Segars & Grover, 1998). The Q-sort instrument used in this study included a description of the constructs as well as a random listing of the candidate items to be considered in the scale. The instrument was pretested by three professors and was then administered to five senior executives in the field. The instructions that were provided on the instrument asked the respondents to indicate which items are most closely associated with the construct definition and to show any instance of ambiguity or lack of clarity in the wording of scale items. Qualtrics has a special question type, “Pick, Group, and Rank,” which was used to conduct the Q-sort test.

As indicated in Appendix B, the results of the Q-sort analysis seemed to provide strong evidence of construct validity. Out of the 35 items of the survey (excluding demographic items), 29 individual items were correctly classified at a rate of 67% or greater. These items seem to exhibit consistent meaning across the panel and, therefore, were retained for further analysis as measures of their associated constructs. Six items were correctly classified at lower rates. These items seemed to exhibit inconsistent meaning across the panel and, therefore, were rephrased, as indicated in the following points.

1. In the construct of supporting decisions related to business, the item “The ERP system supports decisions that improve my company’s return on equity (ROE)” was rephrased as “The ERP system supports decisions that improve my company’s earnings per share (EPS).”
2. In the construct of supporting decisions related to ethics, the item “The ERP system helps determine the negative side effects (if any) of a decision and the probability and concentration of the effect” was rephrased as “The ERP system helps determine the decision’s negative side effects on the community (if any).”

3. Also, in the construct of supporting decisions related to ethics, the item “The ERP system helps identify the duration that a decision’s negative outcome may appear” was rephrased as “The ERP system design enables governance of ethical aspects in decision making.”
4. And, in the construct of supporting decisions related to ethics, the item “The ERP system helps ensure that professional CE guide my company’s strategic planning” was rephrased as “The ERP system helps ensure that the company’s strategic plans follow professional CE.”
5. In the construct of balanced support of ERP system to both types, the item “The ERP system reviews each decision related to business ethically” was rephrased as “The ERP system helps make decisions related to business more than it helps make decisions related to ethics,” which was evaluated using reverse score.
6. In the construct of system performance, the item “Overall, the use of an ERP system reduces the probability of undesired consequences in strategic decision making” was rephrased as “Overall, the use of the ERP system reduces the chances of getting involved in a business lawsuit or unethical scandal.”

The updated complete survey was moved forward to the pilot test, as depicted in the following paragraph.

Pilot test. After conducting the Q-sort test and adjusting the survey questions accordingly, the next step taken was to conduct a pilot test using the updated survey. The main purpose of pilot testing a survey questionnaire is to analyze whether: each research question can really measure what it is meant to measure, the contents of the questionnaire are understood by each participant, the study participant interprets research questions in a way similar to the researcher, and the layout of response choices is appropriately organized in the questionnaire (Fink, 2015).

The sample size of a pilot study could be approximately 10 participants (Hertzog, 2008). According to Connelly (2008), extant literature has suggested that a pilot study sample should be 10% of the sample projected for the larger parent study (Lackey & Wingate, 1998; Treece & Treece, 1982). However, Hertzog (2008) cautioned that this is not a simple or straightforward issue to resolve because these types of studies are influenced by many factors. Nevertheless, Isaac and Michael (1995) and Hill (1998) suggested 10 to 30 participants for pilots in survey research; Julious (2005), in the medical field, and Van-Belle (2002) suggested 12. However, the final decision is to be guided by cost and time constraints as well as by size and variability of the population (Hertzog, 2008). The sample size used in the pilot survey of this dissertation was 14. Several scholars have recommended that in pilot trials, the focus should be on descriptive statistics and estimation using confidence intervals other than 95% confidence intervals, such as 85% or 75% (Lee, Whitehead, Jacques, & Julious, 2014).

To pilot test the survey questionnaire in the current study, the Amazon's Mechanical Turk (MTurk) facility was used to recruit 20 respondents who work in software and IT departments. After excluding incomplete and inconsistent responses, 14 complete responses were considered suitable for analysis. The results of data analysis are given in Appendix C. The preliminary investigation of the pilot study showed that the four hypotheses of the research were statistically supported with a reasonable level of significance as a pilot study. H_1 was supported with a positive coefficient of 0.304, H_2 with a positive coefficient of 0.266, H_3 with a positive coefficient of 0.042, and H_4 with a positive coefficient of 0.046. The predicted regression model according to the pilot study was

$$PSP = 1.118 + 0.304\ BRF + 0.266\ ERF + 0.042\ EBB + 0.046\ EBB * POE \qquad (6)$$

Two changes to the survey items are conducted based on the pilot test. First, in the construct of balanced support of ERP system to both types, the item "The ERP system reviews each decision related to business ethically" was rephrased as "The ERP system reviews each decision related to business according to ethical factors, such as SR, moral obligations, balancing stakeholders' interest, or complying with CE" to be more clear to respondents. Second, in the construct of system performance, an additional item, "Overall, I see all people I know in the company are completely satisfied with ERP performance," was added to consider user satisfaction in the system performance, as suggested by some participants.

The indicated results of the pilot study encouraged the researcher to go forward in conducting the final survey. The updated complete survey was used for conducting the final survey with different ERP practitioners.

Recruiting survey participants. An increasing number of researchers have been capitalizing on the growth of crowd-sourced participant pools, such as Amazon's Mechanical Turk (MTurk) and TurkPrime (a new academic research panel recruitment firm). One of the main issues that has been occupying scientists using this pool of participants is data quality (Goodman, Cryder, & Cheema, 2013). Recent studies have shown several approaches to ensure participant's data quality, such as using attention check questions to screen out inattentive respondents (Aust, Diedenhofen, Ullrich, & Musch, 2013). MTurk, however, offers researchers information about the participants' past performance, or reputation, in the form of approval ratings. Every time that a participant (worker in MTurk terms) completes a task (human intelligence task or "HIT" in MTurk terms), the provider (requester in MTurk terms) of that task can approve or reject a participant's submission.

Rejecting a participant's submission involves denying the participant's payment for completing the HIT and reflects negatively on that participant's account. MTurk allows researchers to set a minimum qualification for workers to participate in a HIT. The main objective of setting this kind of qualification is to ensure that the responses collected in the study are reliable and credible (Peer, Vosgerau, & Acquisti, 2014).

Buhrmester, Kwang, and Gosling (2011) described and evaluated the potential contributions of MTurk to the social sciences. Buhrmester, et al. (2011) stated that "most important, we found that the quality of data provided by MTurk met or exceeded the psychometric standards associated with published research" (p. 5). Their research findings indicated that:

> (a) MTurk participants are slightly more demographically diverse than are standard Internet samples and are significantly more diverse than typical American college samples; (b) participation is affected by compensation rate and task length, but participants can still be recruited rapidly and inexpensively; (c) realistic compensation rates do not affect data quality; and (d) the data obtained are at least as reliable as those obtained via traditional methods. Overall, MTurk can be used to obtain high-quality data inexpensively and rapidly. (Buhrmester, et al., 2011, p. 3)

Kennedy, Clifford, Burleigh, Jewell, and Waggoner (2018) stated that "though met with skepticism by some, MTurk respondents tend to yield high-quality data when respondents are screened on reputation. In many situations, MTurk samples have been found to provide higher quality data than student samples, community samples…" (p. 1).

Amazon's TurkPrime is a new academic research panel recruitment firm and a third-party entity separate from the MTurk platform. TurkPrime offers a number of more targeted recruitment services. Recruitment is accomplished through TurkPrime's independent recruitment service Concierge Services, which extends beyond MTurk to hundreds of other web-based platforms to reach up to 20 million respondents globally (Waggoner, 2018). Concierge Services of TurkPrime takes care of the participant compensation, correspondence, study setup and management and survey distribution. Tasks that can be implemented with TurkPrime include excluding participants on the basis of previous participation, longitudinal studies, making changes to a study while it is running, automating the approval process, increasing the speed of data collection, sending bulk e-mails and bonuses, enhancing communication with participants, monitoring dropout and engagement rates, and providing enhanced sampling options (Litman, Robinson & Abberbock, 2017). Also, TurkPrime uses block duplicate IP addresses, block suspicious locations, and block duplicate geolocations tools to exclude repeated responses and verifies the U.S. location by requiring the user to provide bank account and tax information through Amazon payments.

In recent literature, several researchers have used TurkPrime for recruiting participants in their surveys that are developed and published on Qualtrics. Parker, Andrei, and Van den Broeck (2019) used Qualtrics and TurkPrime for developing a survey and recruiting participants in their research on work design strategies. Wynne and Lyons (2019) in their research on teaming perceptions in a human-machine domain used both Qualtrics and TurkPrime for developing the research survey and recruiting participants. Nichols, Stolze, and Kirchoff (2019) used Qualtrics and TurkPrime for developing a survey and recruiting participants in their research on the effects of supply chain news on consumers' perceptions of product quality. The wide use of both Qualtrics and TurkPrime platforms encouraged the researcher to use them in this study.

Preparing Qualtrics for receiving survey participants. The research survey was developed and displayed online using Qualtrics through the University of Wisconsin–Whitewater. Qualtrics includes several advanced question types and survey flow mechanisms to improve the display and the quality of collected data. The statement of consent question was developed as a multiple-choice question, with two choices (Yes/No), single answer, force response, and skip logic to the end of survey in case of answer (No). The first two demographic questions of using ERP and using ERP in strategic decision making were also developed as multiple choice questions, each with two choices (Yes/No), single answer, force response, and skip logic to the end of survey in case of answer (No). The remaining demographic questions of Vendors, Industry, and Size were developed as multiple choice questions with force response, while Age was developed as a text entry with force response. All other questions of parts 2, 3, 4, 5, and 6 were developed as matrix table questions with a 7-point Likert scale and force response. As response time may indicate insufficient effort in responding to surveys (Huang, Curran, Keeney, Poposki, & DeShon, 2012), a speeding check was included to remove participants who completed a part of the survey in shorter time than needed for completion. A special hidden question of type, Timing, was added after part 2 and after part 3 to measure the time spent in each part. In the survey flow options, a successful end of survey message was added with a link to the TurkPrime site, and another message was displayed with another link to the TurkPrime site in case of an unsuccessful end of survey. To discourage multiple responding, Peer et al. (2014) recommended using the “Prevent Ballot Box Stuffing” option in Qualtrics.

The survey was set up and coded on Qualtrics, and TurkPrime used PrimePanels to distribute the Qualtrics link to panel members who had previously indicated on demographic items of being ERP users with strategic decision-making experience.

The researcher ensured data quality in several ways, such as including response consistency checks and using additional items to search for evidence of lack of attention among respondents. To ensure an appropriate level of respondent knowledge, only participants meeting the following two criteria were included in the study: there is an ERP system adopted in his or her company, and he/she uses ERP in strategic decision making.

Data Analysis

The data analysis was conducted in three phases. In the first phase, the analysis started with an examination of the descriptive statistics of the research variables. The main objective of descriptive statistics is to provide information in concise, clear, and accurate ways (Barrow, 1996). Because descriptive statistics are not able to provide more insights other than to describe the observed data, further statistical tests were undertaken in phases two and three.

In the second phase, a tiered estimation procedure of multiple regression was used to show the incremental gain in the model's fit and test research hypotheses. Four linear regression models were used to analyze the collected data. All constructs in these models were calculated as averages of measured items. Linear regression is the most basic and commonly used predictive analysis method, as reported in the literature (Jalal, Dowd, Sainfort, & Kuntz, 2013). The data were analyzed using statistical analysis software SPSS-24.

However, the result of multiple regression analysis did not support the fourth hypothesis of this research. Hence, a third phase of analysis was required to further investigate and reconcile the hypothesis that was not accepted and to explore and test options for improving the structural model (Hair, Hollingsworth, Randolph, & Chong, 2017). Rigdon, Sarstedt, and Ringle (2017) and Musil, Jones, and Warner (1998) among others used SEM along with multiple regression in their research to illustrate different perspectives of their research models.

In the third phase of data analysis, the informative model of phase two was transferred to a reflective model. Rather than calculating values of constructs as averages of measurable items in the informative model, in the reflective model all constructs were treated as latent variables (factors) defined over sets of observable items (indicators). The PLS-SEM approach (Hair et al., 2017) was applied to investigate both measurement model (factors) and structural model (relationships). The three phases of data analysis are addressed in the following three paragraphs.

Descriptive Statistics of the Research Variables

The descriptive statistics of the research variables included central tendency, dispersion, frequencies, and crosstabs of variables. It also included checking of scale reliability with Cronbach's alpha. It was noticed that there was no missing data in the dataset because the survey administered by Qualtrics enforced answering all questions. The following two paragraphs explain the central tendency and dispersion of variables and the analysis of scale reliability.

Central tendency and dispersion of variables. The descriptive statistics of the collected data from a sample of 170 participants are reported in nine items. First the distribution of ERP vendors among companies of participants is illustrated in Table 5. As clarified in Table 5, SAP, Oracle, and Microsoft were vendors with the highest portion of the sample, representing almost 79%. This result was consistent to some extent with publications on the market share of ERP systems, as reported by Menon, Muchnick, Butler, and Pizur (2019).

Second, the distribution of a company's size expressed as the approximate number of employees along with the ERP vendor in each company of participants is illustrated in Table 6. As clarified in Table 6, SAP, Oracle, and Microsoft were vendors employed in companies with the largest size in the sample. This result may be due to the high levels of investment in products of these three vendors.

Third, the distribution of industry type along with the ERP vendor in each company of participants is illustrated in Table 7. As clarified in Table 7, the Transportation and Public Utilities, Wholesale and Retail Trade, and Manufacturing industries had the highest rate of ERP adoption. SAP, Oracle, and Microsoft had the highest market share in these sectors. This is consistent to some extent with the data given in Menon et al. (2019).

Fourth, the distribution of age along with the ERP vendor in each company of participants is illustrated in Table 8. As clarified in Table 8, young companies had a higher rate of adopting Microsoft Dynamics ERP. The reason may be because young companies are more oriented to Windows technologies.

Fifth, the descriptive statistics of business factors that aid strategic decision making are depicted in Table 9. As clarified in Table 9, the highest fit in the sample was for supporting decisions that improve the company's ROI and improve customers' satisfaction in general.

Sixth, the descriptive statistics of ethical factors that aid strategic decision making are depicted in Table 10. As clarified in Table 10, the highest fit in the sample was for decisions that help identify social service opportunities for the company (e.g., corporate social responsibility).

Seventh, the descriptive statistics of the balanced fit to business and ethics factors is depicted in Table 11. As clarified in Table 11, there was a wide range of the items measuring the levels of balanced fit to both business and ethics factors in the sample.

Eighth, the descriptive statistics of the perceived ERP performance is depicted in Table 12. As clarified in Table 12, the highest dimension of the perceived ERP performance in the sample was the accomplishment of company's strategies and goals.

Ninth, the descriptive statistics of the perceived organizational ethics is depicted in Table 13. As clarified in Table 13, the highest dimension of the perceived organizational ethics in the sample was "managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in personal gain (rather than corporate gain)."

Table 5

Distribution of Enterprise Resource Planning Vendors among Companies of Participants

SN[a]	Vendor	%	n[b]
1	SAP	24.1%	89
2	Oracle	29.5%	109
3	Microsoft Dynamics	25.4%	94
4	Epicor	4.3%	16
5	Infor	3.2%	12
6	Sage	7.8%	29
7	In-house Developed System	4.9%	18
8	Others	0.8%	3
	Total	100.0%	370[c]

a serial number
b for subsamples
c Some companies have more than one vendor

Table 6

Distribution of Company's Size along with the Enterprise Resource Planning Vendor

SN[a]	Company Size (Employees)	%	n[b]	SAP	Oracle	Microsoft	Epicor	Infor	Sage	In-house	Others
1	Less than 500	24.7%	42	16	28	14	1	0	6	2	3
2	From 501 to 5,000	48.2%	82	42	49	54	10	9	14	9	0
3	From 5,001 to 20,000	17.6%	30	23	19	16	4	3	6	5	0
4	Above 20,000	9.4%	16	8	13	10	1	0	3	2	0
	Total	100.0%	170	89	109	94	16	12	29	18	3

a serial number
b for subsamples

Table 7

Distribution of Industry Type along with the Enterprise Resource Planning Vendor

SN[a]	Industry	%	N[b]	SAP	Oracle	Microsoft	Epicor	Infor	Sage
1	Agriculture, Forestry and Fishing	1.8%	3	2	1	2	0	0	0
2	Mining	0.0%	0	0	0	0	0	0	0
3	Construction	6.5%	11	7	6	0	0	2	0
4	Manufacturing	17.6%	30	19	18	15	3	2	4
5	Transportation and Public Utilities	6.5%	11	8	8	6	1	0	2
6	Wholesale and Retail Trade	12.9%	22	11	16	13	2	2	5
7	Finance, Insurance and Real Estate	15.3%	26	15	13	7	2	4	1
8	Services	22.9%	39	17	26	19	1	3	7
9	Others (Please specify) ___	16.5%	28	10	18	20	2	3	5
	Total	100.0%	170	92	107	97	16	17	29

a serial number
b for subsamples

Table 8

Distribution of Company Age Along with the Enterprise Resource Planning Vendor

SN[a]	Company Age	%	n[b]	SAP	Oracle	Microsoft	Epicor	Infor	Sage	In-house	Others
1	Age less than 30 years	61%	102	63	68	65	12	9	23	12	1
2	Age from 30 to below 60 years	20%	34	14	26	19	4	2	6	3	1
3	Age from 60 to below 90 years	10%	17	5	8	6	0	1	0	0	0
4	Age from 90 and above	9%	15	6	7	4	0	0	0	3	0
		100%	168[c]	88	109	94	16	12	29	18	2

a serial number
b for subsamples
c two missing values

Table 9

Descriptive Statistics of System Fit to Business Requirements

Code	Item	Min	Max	*M*	*SD*	Var	*N*
Financial Aspects Fit (FA)							
FA1	The ERP supports decisions that improve my company's return on investment (ROI).	2	7	5.90	1.075	1.156	170
FA2	The ERP supports decisions that improve my company's earnings per share (EPS).	1	7	5.82	1.106	1.223	170
FA3	The ERP supports decisions that improve my company's return on assets (ROA).	1	7	5.79	1.216	1.478	170
Customer Aspects Fit (CA)							
CA1	The ERP supports decisions that improve our customer's perception of products quality.	2	7	5.88	1.168	1.363	170
CA2	The ERP supports decisions that improve our customer's perception of services quality.	2	7	5.81	1.156	1.337	170
CA3	The ERP supports decisions that improve our customer's satisfaction in general.	1	7	5.91	1.111	1.234	170
Business Process Aspects Fit (BP)							
BP1	The ERP supports decisions that improve my company's productivity.	1	7	5.94	1.180	1.393	170
BP2	The ERP supports decisions that improve my company's production cycle time.	2	7	5.82	1.113	1.239	170
BP3	The ERP supports decisions that improve my company's responsiveness of customer service.	1	7	5.86	1.232	1.518	170
Organizational Learning and Innovativeness Aspects Fit (LI)							
LI1	The ERP supports decisions that enhance my company's existing capabilities and skills.	2	7	5.87	1.154	1.332	170
LI2	The ERP supports decisions that improve the rate my company introduces new products or services.	2	7	5.80	1.123	1.262	170
LI3	The ERP supports decisions that improve the rate my company introduces new methods of production or services.	2	7	5.86	1.090	1.187	170

ERP = enterprise resource planning

Table 10

Descriptive Statistics of System Fit to Ethics Requirements

Code	Item	Min	Max	*M*	*SD*	Var	*N*
Social Responsibility Fit (SR)							
SR1	The ERP helps identify social service opportunities for my company (e.g., Corporate Social Responsibility).	2	7	5.54	1.231	1.516	170
SR2	The ERP helps evaluate goals for my company to achieve by participating in social services (e.g., Corporate Social Responsibility).	3	7	5.72	1.183	1.399	170
SR3	The ERP helps determine how long my company should support each social service activity.	1	7	5.56	1.273	1.621	170
Moral Intensity Fit (MI)							
MI1	The ERP helps determine the decision's negative side effects on the community (if any).	1	7	5.42	1.384	1.914	170
MI2	The ERP helps determine the level of social agreement for each decision.	3	7	5.58	1.200	1.440	170
MI3	The ERP design enables governance of ethical aspects in decision making.	2	7	5.66	1.202	1.445	170
Stakeholder Involvement Fit (SI)							
SI1	The ERP helps stimulate stakeholder involvement in each decision-making process.	1	7	5.65	1.223	1.496	170
SI2	The ERP helps enable stakeholders to work together as win-win partners.	2	7	5.63	1.201	1.442	170
SI3	The ERP helps promote mutual trust amongst different stakeholders.	2	7	5.65	1.252	1.567	170
Codes of Ethics Fit (CE)							
CE1	The ERP helps verify that professional Codes of Ethics are complied with/followed by all stakeholders.	2	7	5.65	1.173	1.376	170
CE2	The ERP helps identify the consequences for a violation of professional Codes of Ethics.	2	7	5.61	1.260	1.588	170
CE3	The ERP helps ensure that the company's strategic plans follow professional Codes of Ethics.	2	7	5.71	1.117	1.248	170

ERP = enterprise resource planning

Table 11

Descriptive Statistics of the Balanced Fit to Business and Ethics Factors

Code	Item	Min	Max	*M*	*SD*	Var	*N*
Ethics-Business Balanced Fit (EBB)							
EBB1	The ERP helps make decisions related to ethics as much as it helps make decisions related to business.	1	7	5.62	1.264	1.599	170
EBB2	The ERP helps make decisions related to business more than it helps make decisions related to ethics.	1	7	2.19	1.172	1.373	170
EBB3	The ERP system reviews each decision related to business according to ethical factors, such as social responsibility, moral obligations, balancing stakeholders' interest, or complying with codes of ethics.	2	7	5.69	1.157	1.338	170

ERP = enterprise resource planning

Table 12

Descriptive Statistics of the Perceived Enterprise Resource Planning Performance

Code	Item	Min	Max	*M*	*SD*	Var	*N*
Perceived System Performance (PSP)							
PSP1	Overall, the use of an ERP makes it more convenient to accomplish my company's strategies and goals.	1	7	5.82	1.190	1.416	170
PSP2	Overall, the use of the ERP reduces the chances of getting involved in a business lawsuit or unethical scandal.	2	7	5.75	1.161	1.347	170
PSP3	Overall, the use of an ERP reduces the later regret of not taking a different decision.	1	7	5.81	1.208	1.459	170
PSP4	Overall, I see all people I know in the company are completely satisfied with ERP performance.	1	7	5.79	1.230	1.514	170

ERP = enterprise resource planning

Table 13

Descriptive Statistics of the Perceived Organizational Ethics

Code	Item	Min	Max	*M*	*SD*	Var	*N*
Perceived Organizational Ethics (POE)							
POE1	Managers in my company often engage in behaviors that I consider to be unethical.	1	7	3.61	2.217	4.915	170
POE2	In order to succeed in my company, it is often necessary to compromise one's ethics.	1	7	3.71	2.169	4.706	170
POE3	Top management in my company has let it be known in no uncertain terms that unethical behaviors will not be tolerated.	1	7	5.49	1.633	2.666	170
POE4	Managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in personal gain (rather than corporate gain).	1	7	5.69	1.481	2.192	170
POE5	Managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in corporate gain (rather than personal gain).	1	7	5.65	1.497	2.240	170

Scale reliability analysis. The scale reliability analysis was conducted using Cronbach's alpha tests. If the value of Cronbach's alpha coefficients in the scale reliability statistics was below 0.6, further analysis of individual items statistics was conducted to determine the improvement in the Cronbach's alpha coefficients if the items dropped. The following are the results of the test: the Cronbach's alpha coefficient of system fit to business requirements (*BRF*) was .916; the Cronbach's alpha coefficient of system fit to ethics requirements (*ERF*) was .952; the Cronbach's alpha coefficient of perceived system performance (*PSP*) was .883; the Cronbach's alpha coefficient of perceived organizational ethics (*POE*) was .603; the value of Cronbach's alpha coefficient in scale reliability statistics of the balanced fit to ethics and business requirements (*EBB*) construct was below the recommended threshold (Nunnally & Bernstein, 1994), so further analysis of individual items statistics was conducted, as shown in Table 14, to determine the improvement in Cronbach's alpha coefficient if item deleted.

Table 14

Item-Total Statistics of the Balanced Fit to Ethics and Business Requirements Construct

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Ethics-Business Balanced Fit-EBB1	7.88	1.122	.002	-2.831
Ethics-Business Balanced Fit-EBB2	11.31	4.666	-.655	.741
Ethics-Business Balanced Fit-EBB3	7.81	1.246	.055	-2.769

As illustrated in Table 14, Cronbach's alpha if Item *EBB2* was deleted was .741. After deleting this item, the resulting value of Cronbach's alpha coefficient of *EBB* was accepted. The reason *EBB2* did not load well with the others may be because the item asked in a reverse score if ERP can help make decisions related to business more than it helps make decisions related to ethics, which has wide differences in practical implementations of ERP systems.

The final results of the scale reliability analysis showed that after dropping one item in the EBB construct, the Cronbach's alpha coefficients ranged from .603 to .952 for all constructs, thus demonstrating construct internal consistencies of the research model (Nunnally & Bernstein, 1994).

Multiple Regression Analysis of Data

The multiple regression analysis of empirical data from 170 respondents was conducted using a tiered estimation procedure. The tiered estimation procedure showed the incremental improvement in R^2, which represented the incremental gain in the model's fit due to adding a variable. Model 1 (Equation 7) was proposed to test the significance of the impact of the system fit to business requirements (*BRF*) construct on the perceived system performance (*PSP*):

$$PSP = \beta_0 + \beta_1 * BRF \qquad (7)$$

Model 2 (Equation 8) was proposed to test the significance of adding the system fit to ethics requirements (*ERF*) construct to the model:

$$PSP = \beta_0 + \beta_1 * BRF + \beta_2 * ERF \qquad (8)$$

Model 3 (Equation 9) was proposed to test the significance of adding the balanced fit to ethics and business requirements (*EBB*) construct to the model:

$$PSP = \beta_0 + \beta_1 * BRF + \beta_2 * ERF + \beta_3 * EBB \qquad (9)$$

Model 4 (Equation 10) was proposed to test the significance of adding the interaction of balanced fit to ethics and business requirements (*EBB*) construct with perceived organizational ethics (*POE*) construct to the model:

$$PSP = \beta_0 + \beta_1 * BRF + \beta_2 * ERF + \beta_3 * EBB + \beta_4 * EBB * POE \quad (10)$$

where $\beta_{0, 1, 2, 3, 4}$ are the coefficients of regression. The four research hypotheses were: $H_1 = \beta_1 > 0$, $H_2 = \beta_2 > 0$, $H_3 = \beta_3 > 0$, and $H_4 = \beta_4 > 0$. The SPSS results of running the four models are summarized in Table 15.

Table 15

SPSS Results of Running the First Four Models

Variables	Model 1	Model 2	Model 3	Model 4
(Constant)	.541 (.332)	.080 (.276)	.037 (.250)	.046 (.251)
BRF	.897 (.056)***	.438 (.068)***	.381 (.062)***	.386 (.063)***
ERF		.560 (.061)***	.211 (.080)**	.216 (.080)**
EBB			.414 (.068)***	.424 (.070)***
*POE * EBB*				-.006 (.008)
R^2	.604	.737	.785	.785
Adjusted R^2	.602	.734	.781	.780
F Change	256.337***	233.816***	201.745***	151.045***
Maximum VIF	1	2.190	4.554	4.587

Note. Dependent variable was perceived system performance (*PSP*). Standard errors are given in parentheses.

**$p < .01$. ***$p < .001$.

BRF = System fit to business requirements

ERF = System fit to ethics requirements

EBB = Ethics-business balanced fit

POE = Perceived organizational ethics

VIF = Variance inflation factor

The results indicated that the unrestricted model (Model 4), including all the main effects of system fit to business requirements (*BRF*), system fit to ethics requirements (*ERF*), balance fit to ethics and business requirements (*EBB*), and the interaction of *EBB* with *POE*, can explain significantly more variance in perceived system performance (*PSP*) compared to the restricted Models 1, 2, and 3. The R^2 of Model 1 was .604; the R^2 of Model 2 was .737; the R^2 of Model 3 was .785; and the R^2 of Model 4 was .785. The R^2 of 0.785 suggested that almost 78.5% of the total variation in the value of perceived system performance (*PSP*) can be explained by the changes of the independent variables. The variance inflation factor values below 6 indicate that regression coefficients are not so much affected by collinearity between independent predictors (McClave & Sincich, 2003).

Results from Model 4 indicated that system fit to business requirements (*BRF*; $\beta_1 = .386$, $p < 0.001$), system fit to ethics requirements (*ERF*; $\beta_2 = .216$, $p < 0.01$), and balance fit to ethics and business requirements (*EBB;* $\beta_3 = .424$, $p < 0.001$) are all positive and significant. Hence, Hypotheses 1, 2, and 3 were supported. The moderating effect of perceived organizational ethics (*POE* * *EBB*; $\beta_4 = -.006$, $p > 0.05$) was not statistically significant. So, the fourth hypothesis was not supported and needed more investigation using PLS-SEM.

Using the coefficients of the unrestricted model (Model 4), the estimated regression model was:

$$PSP = .046 + .386 * BRF + .216 * ERF + .424 * EBB \qquad (11)$$

To investigate the impact of vendor type, industry type, company age, and company size on the perceived system performance (*PSP*), the following Model 5 was proposed:

$$PSP = \beta_0 + \beta_5 * AGE + \beta_6 * SIZ + \beta_7 * VEN1 + \beta_8 * VEN2 + \beta_9 * VEN3 + \beta_{10} * VEN4 + \beta_{11} * VEN5 + \beta_{12} * VEN6 + \beta_{13} * VEN7 + \beta_{14} * IND1 + \beta_{15} * IND2 + \beta_{16} * IND3 + \beta_{17} * IND4 + \beta_{18} * IND5 + \beta_{19} * IND6 + \beta_{20} * IND7 + \beta_{21} * IND8 \quad (12)$$

where *AGE* is the company's age; *SIZ* is the company's size; *VEN1* is SAP; *VEN2* is Oracle; VEN3 is Microsoft; *VEN4* is Epicor; *VEN5* is Infor; *VEN6* is Sage, *VEN7* is in-house, *VEN8* is others. The vendor variables are dummy variables, one of them takes a value of 1 in case it is the type of vendor used by the respondent and all others take value of zero. *VEN8* is the base case where all others take values of zero. Other variables include: *IND1* is Agriculture, Forestry and Fishing; *IND2* is Mining; *IND3* is Construction; *IND4* is Manufacturing; *IND5* is Transportation and Public Utilities; *IND6* is Wholesale and Retail Trade; *IND7* is Finance, Insurance and Real Estate; *IND8* is Services; and *IND9* is others. These variables are dummies, one of them takes a value of 1 in case it is the type of industry of the respondent and all others take value of zero. *IND9* is the base case where all others take values of zero.

Due to the small size of the sample relative to the number of dummy variables, the SPSS result of running the model showed positive relationships but not much statistical significance in several cases of adopting a specific ERP vendor with perceived system performance (*PSP*). The positive regression coefficients were: *VEN1* ($\beta_7 = .213$, $p = .214$), *VEN2* ($\beta_8 = .227$, $p = .180$), *VEN3* ($\beta_9 = .303$, $p = .079$), *VEN5* ($\beta_{11} = .339$, $p = .395$), *VEN6* ($\beta_{12} = .137$, $p = .567$).

Also, the SPSS result showed positive relationships but not much statistical significance between the types of industry with perceived system performance (PSP). The positive regression coefficients were: *IND3* ($\beta_{16} = .178$, $p = .615$), *IND4* ($\beta_{17} = .144$, $p = .574$), *IND5* ($\beta_{18} = .109$, $p = .769$), *IND6* ($\beta_{19} = .196$, $p = .475$), *IND7* ($\beta_{20} = .028$, $p = .918$). The age of the company had a minor impact on the *PSP* ($\beta 5 = .022$, $p = .832$). The size of the company did not show a positive significant relationship with the *PSP*.

To investigate the impact of vendor type, industry type, company age, and company size on the balanced fit to both business and ethics (*EBB*), the following Model 6 was proposed:

$$EBB = \beta_0 + \beta_5 * AGE + \beta_6 * SIZ + \beta_7 * VEN1 + \beta_8 * VEN2 + \beta_9 * VEN3 + \beta_{10} * VEN4 + \beta_{11} * VEN5 + \beta_{12} * VEN6 + \beta_{13} * VEN7 + \beta_{14} * IND1 + \beta_{15} * IND2 + \beta_{16} * IND3 + \beta_{17} * IND4 + \beta_{18} * IND5 + \beta_{19} * IND6 + \beta_{20} * IND7 + \beta_{21} * IND8 \quad (13)$$

Due to the small size of the sample relative to the number of dummy variables, the SPSS result of running the model showed positive relationships but not much statistical significance in several cases of adopting a specific ERP vendor with achieving a balanced fit to both ethics and business (*EBB*). The positive regression coefficients were: VEN1 ($\beta_7 = .182$, $p = .299$), VEN2 ($\beta_8 = .443$, $p < .05$), *VEN3* ($\beta_9 = .390$, $p < .05$), *VEN5* ($\beta_{11} = .362$, $p = .377$), *VEN6* ($\beta_{12} = .109$, $p = .657$).

Also, the SPSS result showed positive relationships but not much statistical significance between the type of industry and achieving a balanced fit with both ethics and business (EBB). The positive regression coefficients were: *IND3* ($\beta_{16} = .532$, $p = .146$), *IND4* ($\beta_{17} = .239$, $p = .363$), *IND5* ($\beta_{18} = .479$, $p = .210$), *IND6* ($\beta_{19} = .326$, $p = .248$), *IND7* ($\beta_{20} = .081$, $p = .774$). The age of the company had a minor impact on achieving the balanced fit ($\beta_5 = .056$, $p = .596$). The size of the company did not show a positive significant relationship with the balanced fit.

An effective way to improve the model fit statistics and to investigate the fourth hypothesis that was not supported in Model 4 of the multiple regression is PLS-SEM (Hair et al., 2017), which is addressed in the next paragraph as a third phase of data analysis.

Partial Least Squares Structural Equation Modeling

For further analysis of the data, the partial least squares structural equation modeling (PLS-SEM) was applied. The SEM method is a second-generation multi-variate method that is used to assess the reliability and validity of the model measures. It allows simultaneous analysis of all the variables in the model instead of analysis done separately (Chin, 1998; Chin & Newsted, 1999). It also allows the measurement error not to be aggregated in a residual error term. The method of SEM has been applied to a variety of research problems, including information systems (Hair et al., 2017).

Nusair and Hua (2010) provided a comparative assessment of SEM and multiple regression research methodologies, showing that despite the fact that multiple regression is considered a well-developed modeling approach to data analysis with a history of more than 100 years, SEM is a powerful statistical technique that establishes both measurement models and structural models. Their research findings indicated that only a limited number of significant relationships are justified by multiple regression, while SEM results reveal more significant relationships after the best-fitting measurement model (Nusair & Hua, 2010).

Also, Cheng (2001) commended SEM because it excels beyond multiple regression in expanding the statistical efficiency for model testing with a single comprehensive method. Cheng's (2001) research results indicated that only one significant relationship in the study could be justified by multiple regression; on the other hand, SEM had helped the researcher to develop new relationships based on the modification indexes, which were also theoretically accepted. As a result of using SEM in Cheng's (2001) research, three relationships were shown to be significant, and the best fitting structural model was established.

The PLS-SEM is a method of SEM, which has minimum demands regarding sample size and generally achieves high levels of statistical power (Reinartz, Haenlein, & Henseler, 2009; Wetzels, Odekerken-Schröder, & Van-Oppen, 2009).

In the current research, to transfer the formative model that is used in multiple regression analysis to a reflective model used in PLS-SEM, all variables in the formative research model were transferred to latent variables or factors. A latent variable is a hypothetical construct that is assessed based on a set of observed variables or indicators.

The fit to business requirements (*BRF*), fit to ethical requirements (*ERF*), balanced fit to ethical and business attributes (*EBB*), perceived organizational ethics (*POE*), and perceived system performance (*PSP*) were considered as latent variables. The basic idea is that a latent variable or factor is an underlying cause of multiple observed variables (indicators). In second-order models, a latent variable may be inferred from a set of sub-constructs, each of which is a latent variable defined by a set of indicators. Figure 11 depicts the reflective research model.

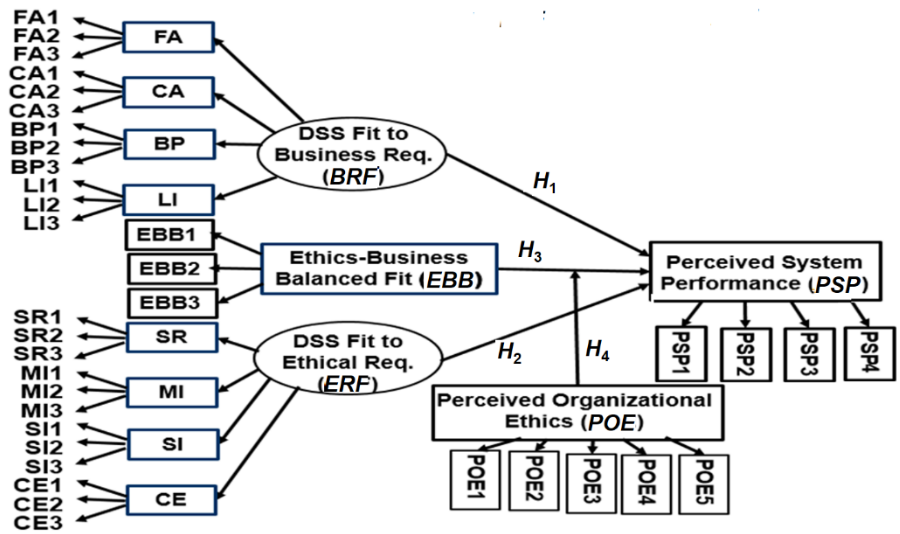

Figure 11. Reflective partial least squares structural equation modeling.
Note: Req. = Requirements

The fit to business requirements (*BRF*) latent variable is an underlying cause of four sub-contrasts: FA, CA, BP, and LI. Each one of the sub-contrasts was identified by three observable indicators. The indicators of FA were FA1, FA2, and FA3. The indicators of CA were CA1, CA2, and CA3. The indicators of BP were BP1, BP2, and BP3. The indicators of LI fit were LI1, LI2, and LI3.

The fit to ethical requirements (*ERF*) latent variable is an underlying cause of four sub-contrasts: SR, MI, SI, and CE. Each one of the sub-contrasts is identified by three observable indicators. The indicators of SR were SR1, SR2, and SR3. The indicators of MI were MI1, MI2, and MI3. The indicators of SI were SI1, SI2, and SI3. The indicators of CE were CE1, CE2, and CE3.

The ethics-business balanced fit (*EBB*) latent variable is an underlying cause of three indicators: EBB1, EBB2, and EBB3. The perceived organizational ethics (*POE*) latent variable is an underlying cause of five indicators: POE1, POE2, POE3, POE4, and POE5. The perceived system performance (*PSP*) latent variable is an underlying cause of four indicators: PSP1, PSP2, PSP3, and PSP4.

To run the reflective PLS-SEM model, the new SmartPLS-3.0 software tool (Ringle, Wende, & Becker, 2015) was used over a different sample of 100 respondents. Figure 12 illustrates the result of running the reflective research model on SmartPLS-3 using PLS Algorithm (Ringle et al., 2015).

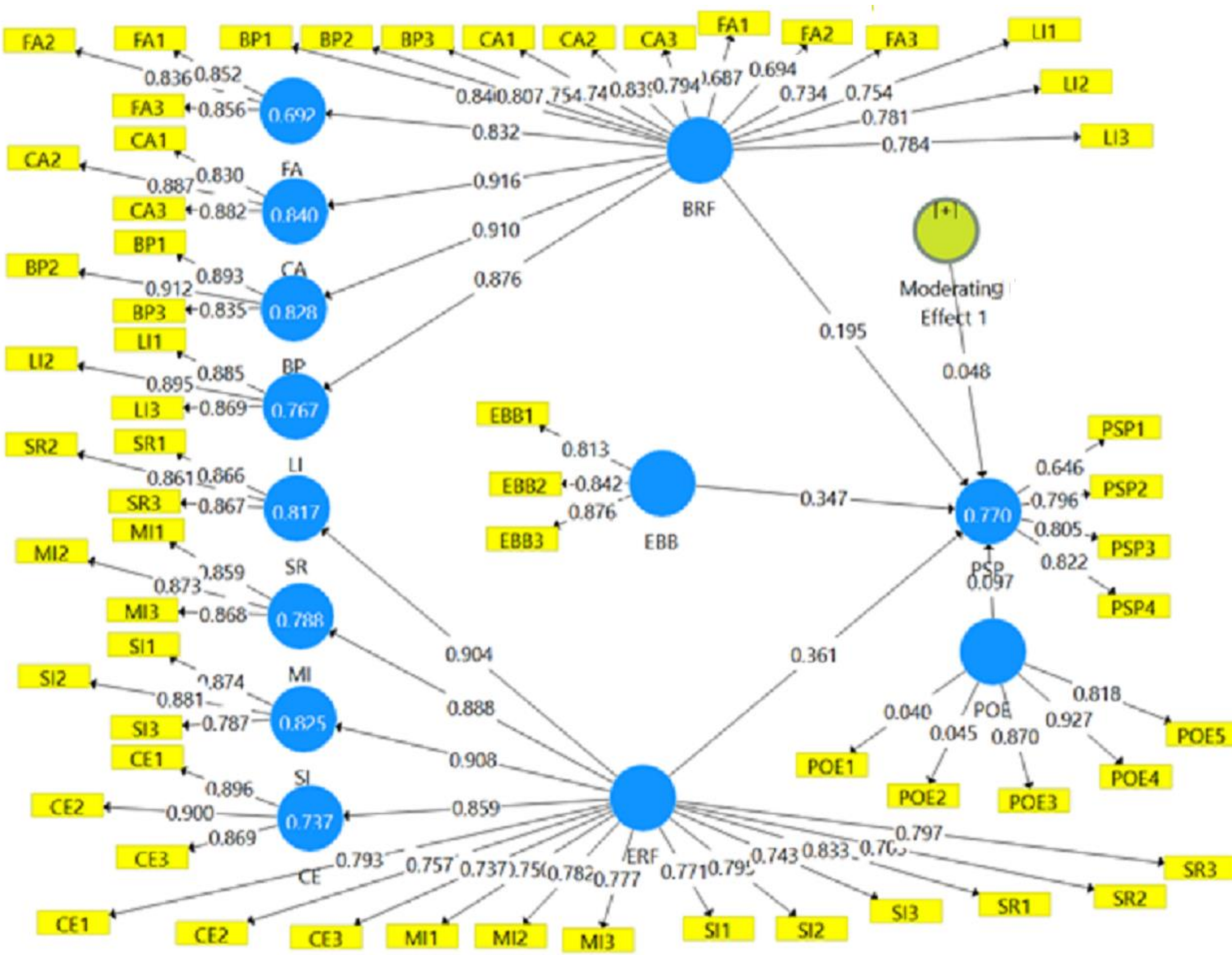

Figure 12. SmartPLS-3.0 results of the initial reflective research model.

Notes: *BRF* = System fit to business requirements

ERF = System fit to ethics requirements

EBB = Ethics-business balanced fit

POE = Perceived organizational ethics

The SmartPLS-3.0 is recommended for PLS-SEM modeling in cases of exploratory research and with a sample size less than 200 (Afthanorhan, 2013; Ringle, Sarstedt, & Straub, 2012). Reinartz et al. (2009) believed that 100 observations can be sufficient to achieve acceptable levels of statistical power in SmartPLS given a certain quality of the measurement model.

Table 16 illustrates the factors loading, average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha of the initial reflective model.

Table 16

SmartPLS-3.0 Results of Initial Reflective Measurement Model

Construct	Items	Loadings[a]	AVE[b]	CR[c]	Cronbach's Alpha[d]	R^{2e}
FA	FA1	0.852	0.720	0.885	0.805	0.692
	FA2	0.836				
	FA3	0.856				
CA	CA1	0.830	0.751	0.900	0.834	0.840
	CA2	0.887				
	CA3	0.882				
BP	BP1	0.893	0.775	0.912	0.854	0.828
	BP2	0.812				
	BP3	0.835				
LI	LI1	0.859	0.780	0.914	0.859	0.767
	LI2	0.873				
	LI3	0.868				
SR	SR1	0.866	0.747	0.899	0.832	0.817
	SR2	0.861				
	SR3	0.867				
MI	MI1	0.859	0.751	0.901	0.834	0.788
	MI2	0.873				
	MI3	0.868				
SI	SI1	0.874	0.720	0.885	0.804	0.825
	SI2	0.881				
	SI3	0.787				
CE	CE1	0.896	0.790	0.918	0.867	0.737
	CE2	0.900				
	CE3	0.869				
EBB	EBB1	0.813	0.712	0.453	-1.164	-
	EBB2	-0.842				
	EBB3	0.876				
PSP	PSP1	0.646	0.594	0.853	0.769	0.770
	PSP2	0.796				
	PSP3	0.805				
	PSP4	0.822				
POE	POE1	0.040	0.458	0.729	0.705	
	POE2	0.045				
	POE3	0.870				
	POE4	0.927				
	POE5	0.818				

[a]Items loadings > 0.6 indicates indicators reliability (Hulland, 1999, p. 198). Indicator Items of loading below 0.6 to be removed are: EBB2, POE1, and POE2. [b]Average variance extracted

(AVE) > 0.5 indicates convergent reliability (Bagozzi & Yi, 1988). [c]Composite reliability (CR) > 0.7 indicates internal consistency (Gefen et al., 2000). [d]Cronbach's alpha > 0.6 indicates indicator reliability (Nunnally & Bernstein, 1994). [e]Chin (1998, p. 323) suggested that values of R^2 above 0.67 are considered high, while values ranging from 0.33 to 0.67 are moderate, values between 0.19 to 0.33 are weak, and any values below 0.19 are unacceptable. Falk and Miller (1992) proposed an R^2 value of 0.10 as a minimum acceptable level.

To evaluate the significance of each link, the bootstrapping algorithm was applied. In bootstrapping, subsamples are created with observations randomly drawn (with replacement) from the original set of data. The subsamples are then used to estimate the PLS path model (Ringle et al., 2015). To ensure stability of results, subsamples as large as 1,000 were selected. Running bootstrapping on 1,000 subsamples resulted in the model in Figure 13. If the *t*-statistics of the bootstrapping model that are indicated on linking arrows were above 1.96, it meant significant loading.

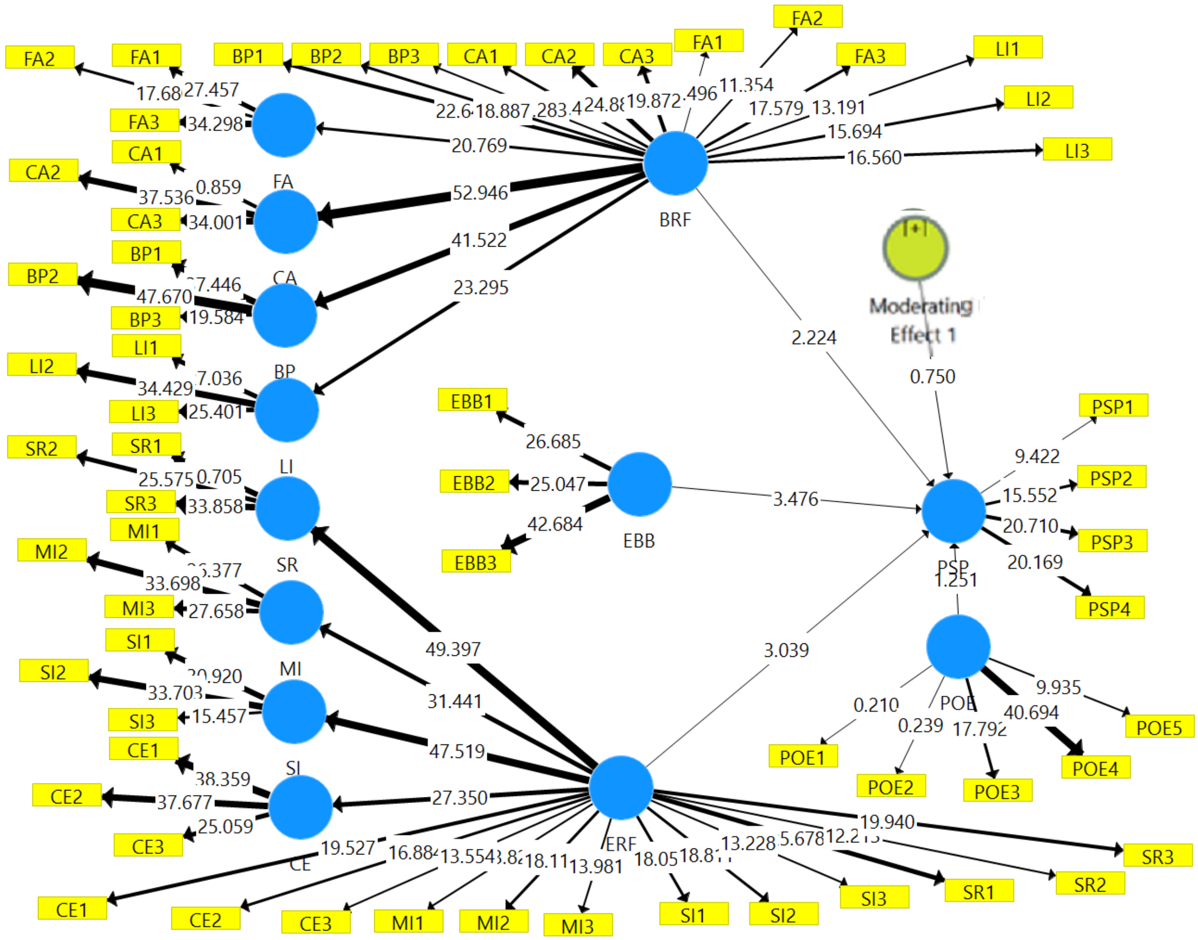

Figure 13. The bootstrapping results of the initial reflective research model.

Notes: *BRF* = System fit to business requirements

ERF = System fit to ethics requirements

EBB = Ethics-business balanced fit

POE = Perceived organizational ethics

Running the initial model on the PLS algorithm (Figure 11) and the bootstrapping algorithm (Figure 12) showed that the factors loading of all latent variables were positive and larger than 0.6, except for three indicators: EBB2, POE1, and POE2. The total R^2 of 0.784 is an accepted value (Hair et al., 2017). The path coefficients were 0.195 for *BRF* on *PSP* ($p < 0.05$), 0.361 for *ERF* on *PSP* ($p < 0.01$), 0.347 for *EBB* on *PSP* ($p = 0.01$), and 0.048 for the *POE* moderating effect on *EBB* to *PSP* ($p = 0.434$). So, the preliminary investigation of the PLS-SEM showed that only the first three hypotheses of the research were statistically supported.

To improve the measurement model, the weak indicators EBB2, POE1 and POE2 were removed. The reason EBB2 did not load well with the others was addressed in previous paragraph of multiple regression analysis. POE1 did not load well with the others, maybe because the item asked in a reverse score about the unethical behaviors of managers in the participant's company, which is considered a sensitive and unclear issue. POE2 did not load well with the others because the item asked also in a reverse score about the necessity to compromise one's ethics for professional success, which is considered a sensitive and unclear issue.

To improve the structural model, the perceived organizational ethics (*POE*) moderating effect on *EBB* to *PSP* was changed to be a direct effect from *POE* on *EBB*. This change is theoretically accepted since the ethical environment of an organization can have a positive impact on achieving a balanced fit of DSS to both business and ethical requirement attributes. This change is very close to the first assumption that the perceived organizational ethics (*POE*) has a positive moderating effect on *EBB*. The results of the new model after removing weak indicators and updating the structural model are illustrated in Figure 14.

Table 17 illustrates the factors loading, AVE, CR, and Cronbach's alpha of the updated reflective model. To evaluate the significance of each link, the bootstrapping algorithm was applied on 1,000 subsamples, which resulted in the model depicted in Figure 15. If the *t*-statistics of the bootstrapping model indicated on linking arrows were above 1.96, it meant significant loading.

Running the updated model on the PLS algorithm (Figure 14) and the bootstrapping algorithm (Figure 15) showed that the factors loading of all latent variables were positive and larger than 0.6, which suggests the indicators' reliability (Hulland, 1999, p. 198). The path coefficients were 0.175 for *BRF* on *PSP* ($p < 0.05$), 0.364 for *ERF* on *PSP* ($p < 0.01$), 0.472 for the *POE* on *EBB* ($p = .001$), and 0.407 for *EBB* on *PSP* ($p < 0.001$). The results supported the four hypotheses of the research (after updating H_4) since all coefficients were positive with $p < 0.05$.

The structural model coefficients of the PLS-SEM model were different than the correspondent coefficients in the regression model, despite that they are in the same directions and ranges. Such minor differences may be tolerated as Bollen (1989) explained regarding the objective of theoretical model testing that involves latent unobserved variables and survey data:

> In virtually all cases we do not expect to have a completely accurate description of reality. The goal is more modest. If the model...helps us to understand the relations between variables and does a reasonable job of matching (fitting) the data, we may judge it (the model) as partially validated. The assumption that we have identified the exact process generating the data would not be accepted. (p.268)

On the other hand, methodologists in the social sciences have warned about regression's potential for sample-to-sample coefficient variation (Cohen & Cohen, 1983).

So, the updated investigation of PLS-SEM showed that all relationships in the updated research model were statistically significant and the first three hypotheses of the research were statistically supported (all had positive coefficients and $p < 0.05$). The fourth hypothesis was statistically supported after being updated to: The perceived organizational ethics has a positive effect on the balanced fit of DSS with both business and ethical requirement attributes.

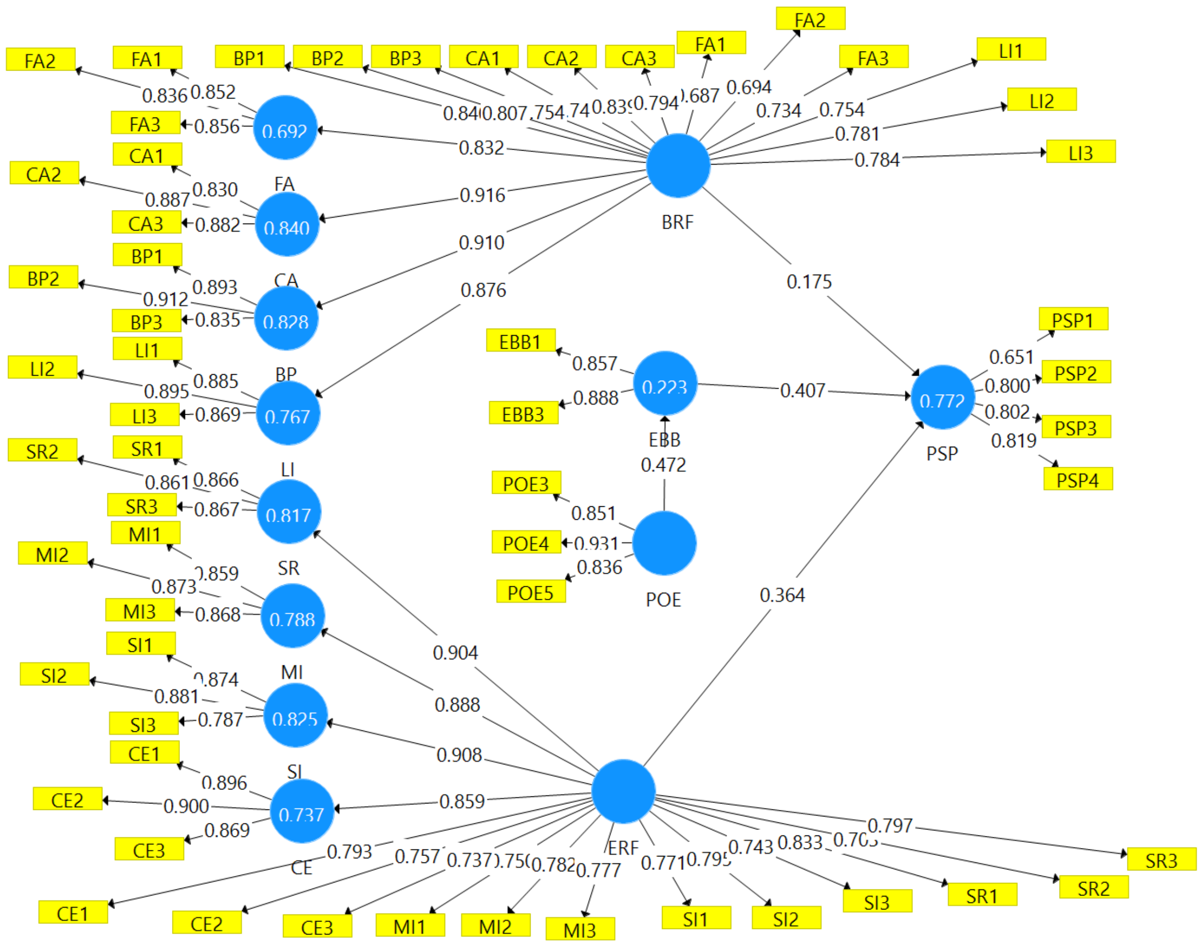

Figure 14. SmartPLS-3.0 results of updated reflective research model.

Notes: *BRF* = System fit to business requirements

ERF = System fit to ethics requirements

EBB = Ethics-business balanced fit

POE = Perceived organizational ethics

Table 17

SmartPLS-3.0 Results of Updated Reflective Measurement Model

Construct	Items	Loadings[a]	AVE[b]	CR[c]	Cronbach's Alpha[d]	R^{2}[e]
FA	FA1	0.852	0.720	0.885	0.805	0.692
	FA2	0.836				
	FA3	0.856				
CA	CA1	0.830	0.751	0.900	0.834	0.840
	CA2	0.887				
	CA3	0.882				
BP	BP1	0.893	0.775	0.912	0.854	0.828
	BP2	0.912				
	BP3	0.835				
LI	LI1	0.885	0.780	0.914	0.859	0.767
	LI2	0.895				
	LI3	0.869				
SR	SR1	0.866	0.747	0.899	0.832	0.817
	SR2	0.861				
	SR3	0.867				
MI	MI1	0.859	0.751	0.901	0.834	0.788
	MI2	0.873				
	MI3	0.868				
SI	SI1	0.874	0.720	0.885	0.804	0.825
	SI2	0.881				
	SI3	0.787				
CE	CE1	0.896	0.790	0.918	0.867	0.737
	CE2	0.900				
	CE3	0.869				
EBB	EBB1	0.843	0.762	0.865	0.689	0.223
	EBB3	0.892				
PSP	PSP1	0.651	0.594	0.853	0.769	0.772
	PSP2	0.800				
	PSP3	0.802				
	PSP4	0.819				
POE	POE3	0.851	0.763	0.906	0.847	-
	POE4	0.931				
	POE5	0.836				

[a]All items loadings > 0.6 indicates indicators reliability (Hulland, 1999, p. 198). [b]All average variance extracted (AVE) > 0.5 indicates convergent reliability (Bagozzi & Yi, 1988). [c]All composite reliability (CR) > 0.7 indicates internal consistency (Gefen et al., 2000). [d]All Cronbach's alpha > 0.68 indicates indicator reliability (Nunnally & Bernstein, 1994). [e]Chin (1998, p. 323) suggested that values of R^2 above 0.67 are considered high, while values

ranging from 0.33 to 0.67 are moderate, values between 0.19 to 0.33 are weak, and values below 0.19 are unacceptable. Falk and Miller (1992) proposed an R^2 value of 0.10 as a minimum acceptable level. The minimum R^2 value in the updated model was 0.223, which is acceptable (Chin, 1998).

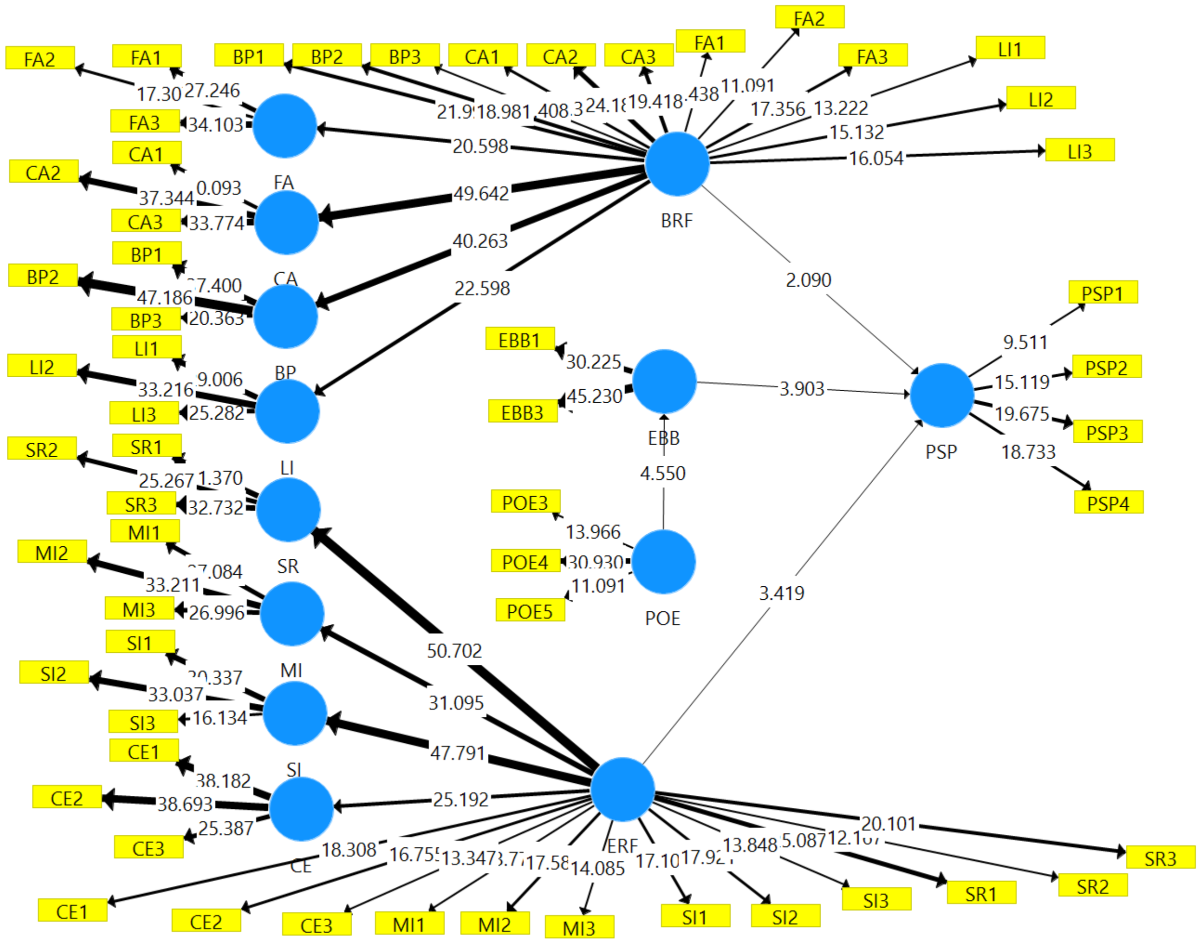

Figure 15. The bootstrapping results of the updated reflective research model.

Notes: *BRF* = System fit to business requirements

ERF = System fit to ethics requirements

EBB = Ethics-business balanced fit

POE = Perceived organizational ethics

Discussion of Results and Potential Contributions

The main purpose of this section is to discuss the results of the study and their implications for both research and practice. The basic expectations of the researcher, similar to other researchers, were that the empirical results would support the four hypotheses of the study. If a hypothesis was not supported, further investigations were conducted to understand the reasons why the hypothesis was not supported and the structural model was adapted accordingly, as addressed in the third phase of data analysis as described previously.

Discussion of Results

The study investigated the impact of achieving a balanced fit of DSS with both the business and ethical requirement attributes (*EBB*) on perceived system performance (*PSP*). The study is important for researchers as well as practitioners. As noticed by Umbach and Humphrey (2018), the poor ethical practice evident in many of corporate failure cases has led to widespread reflection among practitioners and business analysts on the causes of ethical failures in business management.

The results of this research were consistent with previous empirical findings that have reported the positive impact of considering ethical attributes along with business attributes in the problem definition of DSS (Chae et al., 2005; Mathieson, 2007). The results showed that most ERP-based DSS implementations focus on supporting business requirement attributes rather than supporting ethics requirement attributes, which results in lower levels of a system's balanced fit. Keeping a balanced fit of ERP-based DSS with both business and ethical requirement attributes shows a significant impact on the perceived system performance.

Achieving such a right balance accounts for more variance in perceived system performance than the system fit to separate business or ethical aspects alone. The results of both multiple regression modeling and PLS-SEM showed that the regression coefficient of a balanced fit of DSS with both business and ethical requirement attributes (*EBB*) on perceived system performance (*PSP*) is higher than the regression coefficient of the fit to business requirements (*BRF*) and also higher than the regression coefficient of the fit to ethical requirements (*ERF*). After updating the structural model using PLS-SEM, the company's ethical environment showed a significant positive direct effect on the balanced fit.

Adopting a concept of ethics-governance-by-design in ERP-based DSS implementation can achieve higher levels of perceived system performance. In the research survey, the question that asked if the ERP design enables governance of ethical aspects in decision making had the highest mean (5.66) among the three items of the MI construct, as indicated in Table 10. The concept of ethics-governance-by-design can be implemented by adding a new module for representing ethical attributes along with the regular module of business attributes to an ERP's central database. The main role of the ethical module is to guide or restrict the decision maker's judgment on ethical issues. The fourth item of second section addresses the types of decision guidance and restrictiveness in the functionality of the system. Several checks may be conducted in the ethical module to achieve the concept of ethics-governance-by-design, such as checking if there is a conflict of interest with any of the potential suppliers, if each supplier conforms to a CE that is consistent with the organization's code, and if any potential supplier has a history of being taken to court for unethical or illegal business practices.

The example given by Carlson et al. (1999, p. 191) concerned deciding whether to choose a supplier that uses sub-standard parts that are less expensive or one that uses parts according to a standard but are more expensive. In this example, an ethical module in DSS can prompt the user to consider additional factors that might not have otherwise surfaced. In addition to evaluating the MI of each alternative (Jones, 1991), issues related specifically to cognitive moral development could be addressed (Kohlberg, 1981), such as, does any alternative break specific laws or organizational rules? Would choosing any alternative have a negative impact on our organization's standing in the community or industry? And, does any alternative seem inherently wrong, even if it doesn't break any rules or hurt our perceived standing? The consideration of such factors may bring the decision makers to a higher level of cognitive moral development than they would have otherwise been at in making a decision. As a result, implementing the concept of ethics-governance-by-design may be more likely to result in a decision that is more consistent with the organization's higher ethical standards.

An example of technologies used for ethics-governance-by-design implementation can be seen in the case of deploying SAP’s ERP product when the proposed module is implemented using SAP-BW, SAP-SEM, and SAP-ABAP, in addition to interfaces with other third-party DSS tools (Missbach et al., 2016).

Regarding the managerial implications, the findings provided support for the assertion that incorporating an ethics module in ERP-based DSS would be an effective approach to be considered when aiming to improve decision-making processes (Mathieson, 2007). These findings can be considered by top-level management in developing future policies and strategies to implement an ethical ERP-based DSS for achieving more effective and protective decision-making processes at enterprise levels. The research findings presented in the third section provide evidence for practitioners to utilize specific modules in several ERP products from different vendors. The effective use of these modules can achieve higher levels of balanced fit with both ethics and business in ERP-based DSS.

Contributions to Research and Practice

The dissertation contributes to the DSS literature in three ways. First, it demonstrates empirically the need for achieving a balanced fit of ERP-based DSS to both ethics and business requirement attributes. The empirical evidence provided in the study would guide the ERP developers to improve their products' balanced fit to both ethics and business requirement attributes. It also supports the claim that achieving such balanced fit in their products will improve customers' perceptions of system performance.

Second, the study addressed an extension of the TTF to TTBF that is applied in the case of investigating a technology fit to two different tasks working in two different directions. It is important to apply such an extension in cases of adopting a specific technology to support two different tasks with conflicting priorities. It helps define the level of balance that results in the highest performance of technology.

Third, it adds a new concept of ethics-governance-by-design to the DSS research area. The use of such concept in developing a DSS design enables ethical decision-making processes to produce a decision compliant to ethical standards and protects companies against the consequences of unethical scandals, such as those reported in literature and public media.

The dissertation contributes to practice by reviewing the different ERP products and discussing their decision-supporting functionality. It shows how the effective use of ERP modules from each vendor can achieve higher levels of fit to both business and ethical requirement attributes in strategic decision making on the enterprise level.

Limitations and Future Research

The study investigated the impact of achieving a balanced fit of DSS with both business and ethical requirement attributes on perceived system performance. The results indicated that a balanced fit with both business and ethical requirement attributes significantly and positively influences perceived system performance. Nevertheless, this study suffered from some limits.

First, the study did not consider the risk-taking attitude, which may have an impact on focusing on business aspects rather than ethical aspects with lower probabilities of occurrence. Brookfield and Ormrod (2000) believed that the special incentive schemes under executive share options do increase the risk-taking attitude of executives' unethical decision making. Resnick (2013) recommended including provisions in the company's contracts by which the executives themselves refrain from adopting a high risk-taking attitude in supporting strategic decisions. Ignoring the risk-taking attitude may result in different levels of perceived system performance for the same level of system fit. If the risk-taking attitude is considered as an additional construct in the research model, the results will be more accurate.

Second, since self-reporting measures were used and variables were reported by the same individual at the same time, common-method bias has a value at the high boarder of accepted values. Using the Harman's one factor test in the current study indicated a high level of variance accounted by a single factor at 48.7%; however, this is less than the 50% limit advised by Gholami et al. (2018). To generalize the research results, further analysis may be required using separate samples of dependent and independent variables (Podsakoff et al., 2003).

Third, the study was based on the subjective perception of the respondents; consequently, one should be careful when generalizing the results (Udo & Ehie, 1996). However, several steps were taken to ensure the respondents' accuracy and consistency. They were asked to evaluate the DSS with which they were most familiar. Also, respondents were ensured anonymity by returning the questionnaires directly to the recruiting company. Adding more objective measures to evaluate the balanced fit can improve the results. As an example, the direct measures of the use of each DSS in each specific ethical scandals can give more insights to researchers on the level of balanced fit of the system and its impact on system performance.

Fourth, the study did not consider the user and organizational acceptance of the new concept of ethics-governance-by-design in their ERP-based DSS. User and organizational acceptance are a basic factor in adopting a new technology (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019). The two main factors to be measured for evaluating technology acceptance are the ease of use and perceived usefulness. The ease of use is defined as the degree to which a person believes that using a particular system would be free from effort. The perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance (Venkatesh, Morris, Davis, & Davis, 2003, p. 448).

Fifth, the data collected from a specific country, the United States, does not consider the effects of different levels of national culture and ethics on achieving the right balance between ethical and business attributes in a DSS. The national culture and ethics in a country may influence the decision makers' willingness to balance the fit of business and ethics attributes in a DSS (Beekun, Hamdy, Westerman, & HassabElnaby, 2008; McGuire, Payne, Fok, & Kwong, 2016; Newman & Nollen, 1996; Ueno & Wu, 1993). Consequently, the study of decision makers' willingness to balance the fit of business and ethics attributes of DSS in different countries at different levels of ethics and culture is an important area to investigate. However, the United States is one of the most mature countries in terms of ERP adoption and reveals insights that may be generalized to other countries. Conducting a survey in two different countries using two different languages would need a translation-back-translation process to ensure the validity of the measures.

Lastly, the study considered the perceived organizational ethics as one construct rather than examining the effect of different ethical climates, specifically “principled, benevolent, and instrumental” (Simha & Stachowicz-Stanusch, 2013). The five dimensions of ethical climates that have been used in literature are: caring, law and rules, independence, instrumental, and efficiency. Using the five measures for assessing perceived organizational ethics gives a deeper understanding of the construct. However, at this stage of research, organizational ethics is considered as one construct that represents the system of shared norms and values that exist and are practiced throughout the organization (Schein, 2004).

Hence, there are several avenues for future research. First is to test empirically, with larger samples, the proposed theoretical models across several countries with different levels of ethics and cultures. Second is to consider the risk-taking attitude as a predictor of the levels of achieving a balanced fit of DSS. Third is to explore the user and organizational acceptance of the new concept of ethics-governance-by-design in DSS. Fourth is to examine the effects of different ethical climate dimensions on achieving such balanced fit.

It would be also interesting to conduct a study that uses a more objective approach to evaluate the balanced fit. For example, the researcher may directly observe the use of each DSS in each specific ethical scandal. However, such a data collection process would be expensive and would require a lengthy period of observation. Furthermore, techniques such as value analysis (Keen, 1981) may be useful for considering the intangible benefits of such balanced fit of a DSS.

Conclusion

As businesses become larger and more complex, they become more reliant on DSS. Despite the growing use of DSS in making business decisions, several scandals due to unethical decisions have been reported. For a long time, ethical failures have hurt many investors, creditors, suppliers, customers, employees, and even ordinary citizens. Several stakeholders have noticed that business decisions are not always being made at the expected level of integrity (Umbach & Humphrey, 2018).

Despite the fact that corporate failures may be considered nothing new, the poor ethical practice evident in many of these cases has led to widespread reflection among practitioners and business analysts on the causes of ethical failures in business management. In the field of leadership management, scholars have focused on leadership authenticity; in the field of corporate governance, scholars have focused on governance control; and in the field of DSS, which is the main focus of the current research, several scholars have recommended incorporating ethical attributes along with business attributes that are usually employed in the design of DSS. However, the balanced fit between DSS and both business and ethical requirement attributes has not been investigated.

The current research was of an exploratory nature to investigate the impact of achieving such balanced fit on system performance. The results indicated that achieving a balanced fit significantly and positively influences perceived system performance. The scope of the study focused on ERP-based DSS. A research model was proposed leveraging the theory of TTF to examine the impact that attaining a balanced fit of ERP-based DSS with business and ethical requirement attributes has on perceived system performance. A large-scale study was conducted using a random sample of IT practitioners in private commercial companies in the United States. The United States has one of the highest rates of ERP adoption in the world and should offer insights relevant to practitioners in organizations worldwide. Existing scales were adapted and used for most constructs that comprise the research model, while a Q-sorting procedure was conducted to develop and validate new constructs. The survey was pilot tested and revised before participants were solicited for the large-scale study.

The data analysis was conducted in three phases: descriptive statistics and scale reliability, multi-regression modeling, and PLS-SEM. The findings showed that most ERP-based DSS implementations place a greater emphasis on business requirement attributes over ethical requirement attributes, which results in lower levels of a system's balanced fit. The findings also showed that achieving a balanced fit accounts for more variance in perceived system performance than focusing on business or ethical attributes alone. The company's ethical environment has a positive effect on achieving a balanced fit between business and ethical attributes.

This dissertation contributes to the DSS literature in three ways: it demonstrates empirically the need for achieving a balanced fit of DSS to both business and ethical requirement attributes, it extends TTF to TTBF, and it adds a new concept of ethics-governance-by-design to the DSS research area.

The main avenues for future research would be to test empirically, with larger samples, the proposed theoretical models across several countries with different levels of risk-taking attitude, ethics, and cultures in actual scenarios; to explore the user and organizational acceptance of the new concept of ethics-governance-by-design in DSS; and to examine the effect of different dimensions of ethical climates. It would be also interesting to conduct a study that uses a more objective approach to evaluate the balanced fit.

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Appendix A

Survey Instrument

CONSENT AGREEMENT FOR ONLINE RESEARCH STUDY INVOLVING HUMAN SUBJECTS

Title: The right balance: A search for the best fit between business and ethical factors in software that aids strategic decision making.

Investigator:
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Dr. Andrew Ciganek
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Description:

This is a research project conducted at the University of Wisconsin-Whitewater (UWW) that investigates the use of Enterprise Resource Planning (ERP) software to support strategic decisions.

Research Risks:

The risks of study participation include the risk of breaking confidentiality if data were breached. To minimize this risk, many precautions have been taken to ensure the security and privacy of your responses. However, as a participant in electronically collected research data, you need to be aware that there is always a risk of intrusion by outside agents such as hacking, and therefore a risk of being identified.

Research Benefits:

This research seeks a better understanding of the use of ERP to support strategic decisions made by organizations. The research results will be available for survey participants.

Special Populations:

No individuals from special populations will be participating in the research.

Time Commitment and Payment:

The survey requires approximately 15 minutes to complete.

Safeguarding the Identity of Participants:

Results of this study may be used in publications and presentations. Individual names and other personally identifiable information will not be included in any reports or presentations about this study.

All information gathered in this research study will be stored in secure electronic and/or physical locations and protected to the extent afforded by law. However, since this research is conducted in a public education setting, some electronic communications may be subject to open records requests.

Consent for Future Use of Data:

Data, with all identifying information removed, will be kept indefinitely and may be used for future research by the researcher in this study or by others. Because all identifying information will be removed, your participation in this study authorizes this potential future use of unidentifiable data without further notification.

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. However, should you choose to participate and later wish to withdraw from the study, there is no way to identify your anonymous document after it has been submitted to the investigator.

IRB Approval:

This study has been reviewed and approved by The University of Wisconsin-Whitewater's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and university policies. If you have questions or concerns regarding this study, please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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If you would like a copy of this consent page for your records;
via Qualtrics Survey Application - right click with your mouse and select "print."

Statement of Consent:

I certify that I am at least 18 years of age or older, that I have received or have been given an opportunity to print a copy of this consent document and,

( ) Yes, I agree to participate.

( ) No, I decline to participate; in the study as described above.

Part 1: Background:

Do you work with Enterprise Resource Planning Systems (ERP)?

( ) Yes

( ) No.

Do you use ERP for making strategic decisions (i.e., entering new markets, using new technology, or starting a new product line, etc.)?

( ) Yes

( ) No.

Which ERP vendor is in use at your company? (Select all that apply)

( ) SAP

( ) Oracle

( ) Microsoft Dynamics

( ) Epicor

( ) Infor

( ) Sage

( ) In-house Developed System

( ) Others (Please specify) ___.

How many employees are there in your company (approximately)?

( ) Less than 500

( ) From 501 to 5,000

( ) From 5,001 to 20,000

( ) Above 20,000).

Which industry does your company operate in?

( ) Agriculture, Forestry and Fishing

( ) Mining

( ) Construction

( ) Manufacturing

( ) Transportation and Public Utilities

( ) Wholesale and Retail Trade

( ) Finance, Insurance and Real Estate

( ) Services

( ) Others (Please specify) ___.

What is the age of your company (in years)?
(…… Year).

Part 2: Business factors that aid strategic decision making:

The following questions examine the extent that your company's ERP supports (i.e., calculations, modeling, guidance, warnings, restrictions, etc.) decisions related to business, such as decisions for improving financial status, customers' satisfaction, business process capabilities, and levels of learning and innovativeness.

Please indicate your level of agreement with the following items by marking one box in each row:

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
The ERP supports decisions that improve my company's return on investment (ROI).							
The ERP supports decisions that improve my company's earnings per share (EPS).							
The ERP supports decisions that improve my company's return on assets (ROA).							
The ERP supports decisions that improve our customer's perception of products quality.							
The ERP supports decisions that improve our customer's perception of services quality.							
The ERP supports decisions that improve our customer's satisfaction in general.							
The ERP supports decisions that improve my company's productivity.							
The ERP supports decisions that improve my company's production cycle time.							

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
The ERP supports decisions that improve my company’s responsiveness of customer service.							
The ERP supports decisions that enhance my company's existing capabilities and skills.							
The ERP supports decisions that improve the rate my company introduces new products or services.							
The ERP supports decisions that improve the rate my company introduces new methods of production or services.							

Part 3: Ethical factors that aid strategic decision making:

The following questions examine the extent that your company’s ERP supports (i.e., calculations, modeling, guidance, warnings, restrictions, etc.) decisions related to ethics, such as decisions for participating in social services, for fulfilling moral obligations, for balancing stakeholders' interest, and for complying with professional codes of ethics.

Please indicate your level of agreement with the following items by marking one box in each row:

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
The ERP helps identify social service opportunities for my company (e.g., Corporate Social Responsibility).							
The ERP helps evaluate goals for my company to achieve by participating in social services (e.g., Corporate Social Responsibility).							
The ERP helps determine how long my company should support each social service activity.							
The ERP helps determine the decision's negative side effects on the community (if any).							
The ERP helps determine the level of social agreement for each decision.							
The ERP design enables governance of ethical aspects in decision making.							
The ERP helps stimulate stakeholder involvement in each decision making process.							
The ERP helps enable stakeholders to work together as win-win partners.							
The ERP helps promote mutual trust amongst different stakeholders.							
The ERP helps verify that professional Codes of Ethics are complied with/followed by all stakeholders.							
The ERP helps identify the consequences for a violation of professional Codes of Ethics.							
The ERP helps ensure that the company's strategic plans follow professional Codes of Ethics.							

Part 4: Understanding the balance between decisions related to business and related to ethics:

The following questions examine the extent that your company's ERP supports (i.e., calculations, modeling, guidance, warnings, restrictions, etc.) decisions related to business compared to its level of support to decisions related to ethics. Decisions related to business are decisions for improving financial status, customers' satisfaction, business process capabilities, and levels of learning and innovativeness. Decisions related to ethics are decisions for participating in social services, for fulfilling moral obligations, for balancing stakeholder interest, and for complying with professional codes of ethics.

Please indicate your level of agreement with the following items by marking one box in each row:

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
The ERP helps make decisions related to ethics as much as it helps make decisions related to business.							
The ERP helps make decisions related to business more than it helps make decisions related to ethics.							
The ERP system reviews each decision related to business according to ethical factors, such as social responsibility, moral obligations, balancing stakeholders' interest, or complying with codes of ethics.							

Part 5: ERP performance:

The following questions examine the level of performance your company's ERP provides to support strategic decisions. Please indicate your level of agreement with the following items by marking one box in each row:

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
Overall, the use of an ERP makes it more convenient to accomplish my company's strategies and goals.							
Overall, the use of the ERP reduces the chances of getting involved in a business lawsuit or unethical scandal.							
Overall, the use of an ERP reduces the later regret of not taking a different decision.							
Overall, I see all people I know in the company are completely satisfied with ERP performance.							

Part 6: Company's ethical environment:

The following questions examine the extent that your company has established an ethical workplace environment. Please indicate your level of agreement with the following items by marking one box in each row:

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
Managers in my company often engage in behaviors that I consider to be unethical.							

	(1) Disagree Strongly	(2) Disagree Moderately	(3) Disagree Slightly	(4) Neither Agree Nor Disagree	(5) Agree Slightly	(6) Agree Moderately	(7) Agree Strongly
In order to succeed in my company, it is often necessary to compromise one's ethics.							
Top management in my company has let it be known in no uncertain terms that unethical behaviors will not be tolerated.							
Managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in personal gain (rather than corporate gain).							
Managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in corporate gain (rather than personal gain).							

Provide your email if you would like to receive the research results: [______________________]

Thank you for taking our survey

Appendix B

Q-sorting Test: Grouping Enterprise Resource Planning Types of Use

The test was introduces first to participants as: My name is Ahmad Kabil. I am a doctoral student at the University of Wisconsin-Whitewater. For my dissertation, I am studying the use of enterprise resource planning (ERP), which is a type of information system used to support organizational decisions. To complete my dissertation, I will conduct a survey on the types of ERP use to support different strategic decisions. To test the survey validity, I would like to use your expertise in ERP systems to help match a series statements with the most appropriate grouping. Your participation will be most appreciated.

The test was displayed on Qualtrics-UWW as depicted in Figure B1 and links were sent to three academicians and five practitioners through direct emails. The results of the test are listed in Tables B1 through B5. The Statement of Consent and Part 1: Background were not included in the Q-sort test. The changes in survey items based on the Q-sort test are reported in the fifth section. The updated complete survey was pilot tested with different ERP practitioners.

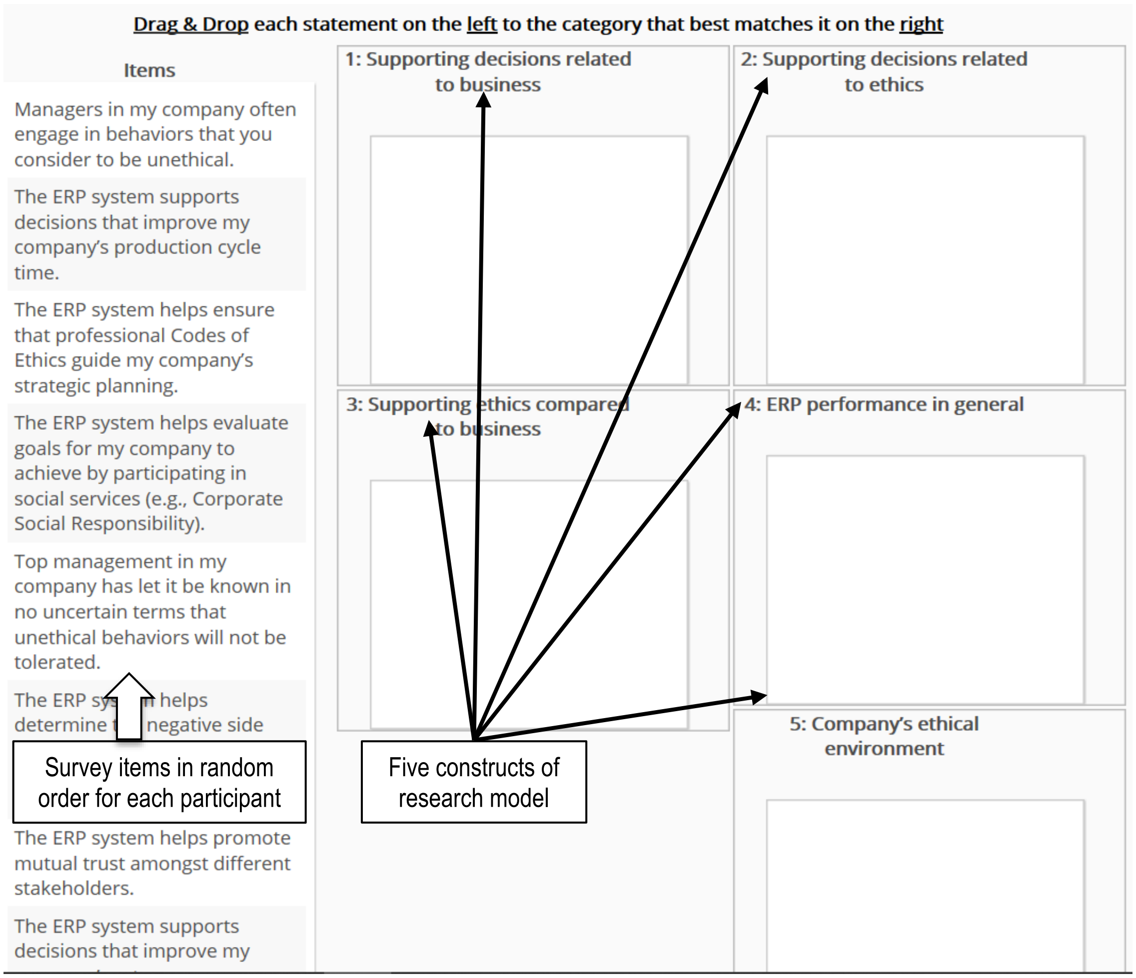

Figure B1. The Platform of Q-sorting Test

Table B1

Part 2: Using the Enterprise Resource Planning System for Supporting Decisions Related to Business

Items	Q-sort Results
The ERP system supports decisions that improve my company’s return on investment (ROI).	Correctly classified at a rate of 100%
The ERP system supports decisions that improve my company’s return on equity (ROE).	Correctly classified at a rate of 100%
The ERP system supports decisions that improve my company’s return on assets (ROA).	Correctly classified at a rate of 67%
The ERP system supports decisions that improve our customer's perception of products quality.	Correctly classified at a rate of 100%
The ERP system supports decisions that improve our customer's perception of services quality.	Correctly classified at a rate of 100%
The ERP system supports decisions that improve our customer’s satisfaction in general.	Correctly classified at a rate of 100%
The ERP system supports decisions that improve my company's productivity.	Correctly classified at a rate of 67%
The ERP system supports decisions that improve my company’s production cycle time.	Correctly classified at a rate of 100%
The ERP system supports decisions that improve my company’s responsiveness of customer service.	Correctly classified at a rate of 100%
The ERP system supports decisions that enhance my company's existing capabilities and skills.	Correctly classified at a rate of 67%
The ERP system supports decisions that improve the rate my company introduces new products or services.	Correctly classified at a rate of 100%
The ERP system supports decisions that improve the rate my company introduces new methods of production or services.	Correctly classified at a rate of 100%

Table B2

Part 3: Using the Enterprise Resource Planning System for Supporting Decisions Related to Ethics

Items	Q-sort Results
The ERP system helps identify social service opportunities for my company (e.g., Corporate Social Responsibility).	Correctly classified at a rate of 67%
The ERP system helps evaluate goals for my company to achieve by participating in social services (e.g., Corporate Social Responsibility).	Correctly classified at a rate of 67%
The ERP system helps determine how long my company should support each social service activity.	Correctly classified at a rate of 67%
The ERP system helps determine the negative side effects (if any) of a decision and the probability and concentration of the effect.	Correctly classified at a rate of 67%
The ERP system helps determine the level of social agreement for each decision.	Correctly classified at a rate of 67%
The ERP system helps identify the duration that a decision's negative outcome may appear.	Correctly classified at a rate of 67%
The ERP system helps stimulate stakeholder involvement in each decision making process.	Correctly classified at a rate of 67%
The ERP system helps enable stakeholders to work together as win-win partners.	Correctly classified at a rate of 100%
The ERP system helps promote mutual trust amongst different stakeholders.	Correctly classified at a rate of 100%
The ERP system helps verify that professional Codes of Ethics are complied with/followed by all stakeholders.	Correctly classified at a rate of 67%
The ERP system helps identify the consequences for a violation of professional Codes of Ethics.	Correctly classified at a rate of 100%
The ERP system helps ensure that professional Codes of Ethics guide my company's strategic planning.	Correctly classified at a rate of 67%

Table B3

Part 4: Balanced Support of Enterprise Resource Planning System to Both Types of Decisions Related to Business and Related to Ethics

Items	Q-sort Results
The ERP system helps make decisions related to ethics as much as it helps make decisions related to business.	Correctly classified at a rate of 100%
The ERP system reviews each decision related to business ethically.	Correctly classified at a rate of 100%
The ERP system reviews each decision related to ethics according to business concern.	Correctly classified at a rate less than 34%

Table B4

Part 5: System Performance

Items	Q-sort Results
Overall, the use of an ERP system makes it more convenient to accomplish my company's strategies and goals.	Correctly classified at a rate of 100%
Overall, the use of an ERP system reduces the probability of undesired consequences in strategic decision making.	Correctly classified at a rate of 67%
Overall, the use of an ERP system reduces the later regret of not taking a different decision.	Correctly classified at a rate of 100%

Table B5

Part 6: Company's Ethical Environment

Items	Q-sort Results
Managers in my company often engage in behaviors that you consider to be unethical.	Correctly classified at a rate of 67%
In order to succeed in my company, it is often necessary to compromise one's ethics.	Correctly classified at a rate of 67%
Top management in my company has let it be known in no uncertain terms that unethical behaviors will not be tolerated.	Correctly classified at a rate of 67%
If a manager in my company is discovered to have engaged in unethical behavior that results primarily in personal gain (rather than corporate gain), he or she will be promptly reprimanded.	Correctly classified at a rate less than 34%
If a manager in my company is discovered to have engaged in unethical behavior that results primarily in corporate gain (rather than personal gain), he or she will be promptly reprimanded.	Correctly classified at a rate less than 34%

Appendix C

Results of the Pilot Test

After conducting the Q-sort test and adjusting the survey questions accordingly, the following step was to conduct a pilot test using the updated survey. The results of pilot test data analysis are given in Tables C1 through C8.

Table C1

Which Enterprise Resource Planning Vendor is in Use at Your Company?

#	Answer	%	Count
1	SAP	26.09%	6
2	Oracle	13.04%	3
3	Microsoft Dynamics	30.43%	7
4	Epicor	8.70%	2
5	Infor	4.35%	1
6	Sage	13.04%	3
7	In-house Developed System	4.35%	1
8	Other (Please specify)	0.00%	0
	Total	100%	23[a]

[a]Some companies had more than one

Table C2

How Many Employees are there in Your Company (Approximately)?

#	Answer	%	Count
1	Less than 500	42.86%	6
2	From 501 to 5,000	35.71%	5
3	From 5,001 to 20,000	0.00%	0
4	Above 20,000	21.43%	3
	Total	100%	14

Table C3

Which Industry does Your Company Operate in?

#	Answer	%	Count
1	Agriculture, Forestry and Fishing	0.00%	0
2	Mining	0.00%	0
3	Construction	0.00%	0
4	Manufacturing	28.57%	4
5	Transportation and Public Utilities	7.14%	1
6	Wholesale and Retail Trade	14.29%	2
7	Finance, Insurance and Real Estate	7.14%	1
8	Services	28.57%	4
9	Others (Please specify) ___	14.29%	2
	Total	100%	14

Table C4

What is the age of your company (in years)?

Age	6	10	23	25	30	38	40	47
Frequency	2	3	1	3	1	1	2	1

Table C5

Part 2: Business Factors that Aid Strategic Decision Making

#	Field	Min	Max	*M*	*SD*	Variance	*N*
1	The ERP supports decisions that improve my company’s return on investment (ROI).	4	7	5.71	.825	.681	14
2	The ERP supports decisions that improve my company’s earnings per share (EPS).	4	7	5.79	.802	.643	14
3	The ERP supports decisions that improve my company’s return on assets (ROA).	4	7	5.57	.938	.879	14
4	The ERP supports decisions that improve our customer's perception of products quality.	5	7	5.79	.802	.643	14
5	The ERP supports decisions that improve our customer's perception of services quality.	4	7	5.79	.893	.797	14
6	The ERP supports decisions that improve our customer’s satisfaction in general.	4	7	5.79	.893	.797	14
7	The ERP supports decisions that improve my company's productivity.	5	7	6.07	.917	.841	14
8	The ERP supports decisions that improve my company’s production cycle time.	4	7	6.00	.784	.615	14
9	The ERP supports decisions that improve my company’s responsiveness of customer service.	5	7	5.93	.730	.533	14
10	The ERP supports decisions that enhance my company's existing capabilities and skills.	4	7	5.86	.864	.747	14
11	The ERP supports decisions that improve the rate my company introduces new products or services.	4	7	5.93	.997	.995	14
12	The ERP supports decisions that improve the rate my company introduces new methods of production or services.	2	7	5.07	1.328	1.764	14

Note: ERP = Enterprise Resource Planning

Table C6

Part 3: Ethical Factors that Aid Strategic Decision Making

#	Field	Min	Max	*M*	*SD*	Variance	*N*
1	The ERP helps identify social service opportunities for my company (e.g., Corporate Social Responsibility).	2	7	5.21	1.578	2.489	14
2	The ERP helps evaluate goals for my company to achieve by participating in social services (e.g., Corporate Social Responsibility).	2	7	5.36	1.646	2.709	14
3	The ERP helps determine how long my company should support each social service activity.	2	7	4.93	1.592	2.533	14
4	The ERP helps determine the decision’s negative side effects on the community (if any).	2	7	4.86	1.460	2.132	14
5	The ERP helps determine the level of social agreement for each decision.	2	7	5.21	1.626	2.643	14
6	The ERP design enables governance of ethical aspects in decision making.	2	7	5.36	1.550	2.401	14
7	The ERP helps stimulate stakeholder involvement in each decision making process.	2	7	5.21	1.528	2.335	14
8	The ERP helps enable stakeholders to work together as win-win partners.	2	7	5.57	1.158	1.341	14
9	The ERP helps promote mutual trust amongst different stakeholders.	2	7	5.64	1.336	1.786	14
10	The ERP helps verify that professional Codes of Ethics are complied with/followed by all stakeholders.	2	7	5.50	1.401	1.962	14
11	The ERP helps identify the consequences for a violation of professional Codes of Ethics.	2	7	5.43	1.604	2.571	14
12	The ERP helps ensure that the company’s strategic plans follow professional Codes of Ethics.	2	7	5.21	1.578	2.489	14

Note: ERP = Enterprise Resource Planning

Table C7

Part 4: Understanding the Balance between Decisions Related to Business and Related to Ethics

#	Field	Min	Max	*M*	*SD*	Variance	*N*
1	The ERP helps make decisions related to ethics as much as it helps make decisions related to business.	2	7	5.07	1.592	2.533	14
2	The ERP helps make decisions related to business more than it helps make decisions related to ethics.	1	6	2.64	1.393	1.940	14
3	The ERP system reviews each decision related to business according to ethical factors, such as social responsibility, moral obligations, balancing stakeholders' interest, or complying with codes of ethics.	2	7	5.29	1.684	2.835	14

Note: ERP = Enterprise Resource Planning

Table C8

Part 5: Enterprise Resource Planning Performance

#	Field	Min	Max	*M*	*SD*	Variance	*N*
1	Overall, the use of an ERP makes it more convenient to accomplish my company's strategies and goals.	4	7	5.21	.975	.951	14
2	Overall, the use of the ERP reduces the chances of getting involved in a business lawsuit or unethical scandal.	3	7	5.21	1.122	1.258	14
3	Overall, the use of an ERP reduces the later regret of not taking a different decision.	4	7	5.57	1.016	1.033	14
4	Overall, I see all people I know in the company are completely satisfied with ERP performance.	4	7	5.57	.852	.725	14

Note: ERP = Enterprise Resource Planning

Table C9

Part 6: Company's Ethical Environment

#	Field	Min	Max	*M*	*SD*	Variance	*N*
1	Managers in my company often engage in behaviors that I consider to be unethical.	2	7	3.79	1.968	3.874	14
2	In order to succeed in my company, it is often necessary to compromise one's ethics.	1	7	3.50	1.912	3.654	14
3	Top management in my company has let it be known in no uncertain terms that unethical behaviors will not be tolerated.	4	7	5.57	.938	.879	14
4	Managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in personal gain (rather than corporate gain).	5	7	5.93	.730	.533	14
5	Managers in my company will be promptly reprimanded if he or she engages in unethical behavior that results primarily in corporate gain (rather than personal gain).	3	7	5.29	1.069	1.143	14

For the linear regression of the pilot test results, the assumed model was:

$$PSP = \mu_0 + \mu_1 \text{ BRF} + \mu_2 \text{ ERF} + \mu_3 \text{ EBB} + \mu_4 \text{ EBB\_POE} \qquad (C1)$$

where PSP is the perceived system performance (average values of Part 5); BRF is the level of DSS fit with business requirement attributes (average values of Part 2); ERF is the level of DSS fit with ethical requirement attributes (average values of Part 3); EBB is the ethics-business balanced fit (average values of Part 4); POE is the perceived organizational ethics (average values of Part 6); and EBB_POE is the moderating effect of perceived organizational ethics on the ethics-business balanced fit. Furthermore, H_1: $\mu_1 > 0$, H_2: $\mu_2 > 0$, H_3: $\mu_3 > 0$, H_4: $\mu_4 > 0$.

Results of the Linear Regression of the Pilot Test:

Model Summary: $R = 0.909$, $R^2 = 0.826$, Adjusted $R^2 = 0.749$, Root Mean Square Error = 0.349

The R-square of 0.826 suggests that almost 83% of the total variation in the value of perceived system performance can be explained by the changes of the independent variables.

Table C10

Analysis of Variance

Model		Sum of Squares	*df*	Mean Square	*F*	*p*
1	Regression	5.227	4	1.307	10.70	0.002
	Residual	1.099	9	0.122		
	Total	6.326	13			

Table C11

Coefficients:

Model		Unstandardized	Standard Error	Standardized	*t*	*p*
1	(Intercept)	1.118	1.713		0.652	0.530
	BRF	0.304	0.302	0.232	1.009	0.340
	ERF	0.266	0.137	0.495	1.946	0.084
	EBB	0.042	0.264	0.057	0.160	0.877
	EBB_POE	0.046	0.037	0.348	1.242	0.246

The preliminary investigation of the pilot study showed that the four hypotheses of the research were statistically supported with a reasonable level of significance as a pilot study. Hypothesis 1 (The level of DSS fit with business requirement attributes has a positive relationship with perceived system performance) was supported with a positive coefficient of 0.304. Hypothesis 2 (The level of DSS fit with ethical requirement attributes has a positive relationship with perceived system performance) was supported with a positive coefficient of 0.266. Hypothesis 3 (The balanced fit of DSS with both business and ethical requirement attributes has a positive relationship with perceived system performance) was supported with a positive coefficient of 0.042. Hypothesis 4 (The perceived organizational ethics has a positive moderating effect on the relationship between the ethics-business balanced fit and perceived system performance) was supported with a positive coefficient of 0.046. The predicted regression model according to the pilot study was:

$$PSP = 1.118 + 0.304\ BRF + 0.266\ ERF + 0.042\ EBB - 0.046\ EBB\_POE. \quad (C2)$$

The changes in survey items based on the pilot test are reported in the fifth section. The updated complete survey was administered with different ERP practitioners.

VITA

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